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Castings Ease Man's Labors By Carrying Coal

AFTER the black substance known as coal first came into use as a fuel, inventors were busy trying to develop a coal burning device that would feed the coal into the furnace continuously, that would admit and mix the correct amount of air to give complete combustion and high temperatures. Although the early attempts were directed more toward smoke prevention and consisted in variations in the design of the combustion chamber, a mechanical

Today the Iron Man Stokes the Furnace

stoker of the traveling grate type was brought out in England in 1819. The original chain grate stoker was invented in 1841 and consisted of a number of longitudinal bars connected to form an endless chain which moved slowly from the front to the rear of the furnace. Overfeed and underfeed type stokers were introduced sometime later. Today the mechanical stoker, with its many refinements, has become a great labor saver and in addition is saving coal and preventing smoke. The modern stoker is constructed chiefly of castings and castings are used extensively in the mechanism carrying the coal into the furnace. A general idea of the stokers sold yearly may be gained from a report of the department of commerce which shows that 1128 units were sold in 1924, 1348 in 1925 and 1361 in 1926.

Find Where Castings Can Be Sold

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Ancient Art *Perfected* in Eastern *Bell Shop*

Fig. 1—Primitive type of furnace and crucible

ABOUT the time Edgar Allen Poe, gloomy and unfortunate genius, author of *The Bells,* was picked up in the streets of Baltimore, a mental and physical wreck, waiting dumbly for the tolling of the iron bells that would mark his passing, another man blithely was beginning the manufacture of bells in a little Connecticut town. The second man had neither fire nor poetic genius. He was just an ordinary product of the times, a clever Yankee mechanic with a New England nose for business.

He knew bell metal, he was skilled in the art of founding and he knew how to sell the bells after they were made. He lived a long and useful life and established his business on such a broad and sensible basis that it flourishes to this day in the capable hands of the third generation, university graduates, two grandsons of the founder.

Bell making is an art that dates back to a period when written history becomes hopelessly confused with hazy myth and nebular tradition. It has been practiced continuously ever since man first discovered how to manipulate metal. Also, incidentally, since he discovered that his ears might serve as a source of pleasure in addition to their legitimate function of preventing his shaggy hair from blowing into his eyes.

Bells enter extensively into the social, religious and industrial activities of the human race. Therefore, it is rather surprising to find that people generally either are densely and cheerfully ignorant, or at best are only vaguely familiar with the composition of bells or of the methods pursued in the various shops in which they are manufactured.

Poe's marvellous description of the bells is one of the classics of the English language. It is perfect in every respect with the single exception that three verses out of the four are technically inaccurate. Probably more than any other single factor, this well known poem has helped to spread and foster the misinformation current among the public on the subject of bells. His reference to brazen bells, "what a tale of terror, now, their turbulency tells," is correct even if he limits their twanging and their clanging to the vicinity of fire stations.

Outside of their nursery association with cockle shells and pretty maids all in a row, silver bells do not figure extensively. The silver sleigh bells that tinkle, tinkle, tinkle in the icy air of night are made either from iron or bronze. Long John Silver had more of the precious metal in his name than the entire assorted collection of all the sleigh bells in the state of Maine.

Gold in small or large quantities usually is considered an important, sometimes necessary and always useful commodity, before, during and after the wedding ceremony, but most assuredly there is no gold in the bells of the establishments where the weddings take place. The young love, the true love may listen in ecstasy to the soft mellow chiming of the bells of St. Mary's—"through the balmy air of night, how they ring out their delight in the molten golden notes," Romance is all right in its place, but the sounding cells from which a gush of euphony voluminously swells, are made not from gold, but from a clever composition of copper and tin.

Neither silver nor gold has the necessary tonal quality to warrant its use in a device that frankly has no other earthly purpose than to make a sound. Either one of these metals is too soft to withstand the action of a hammer or a clapper for any considerable period of time, even if the

By
Pat Dwyer

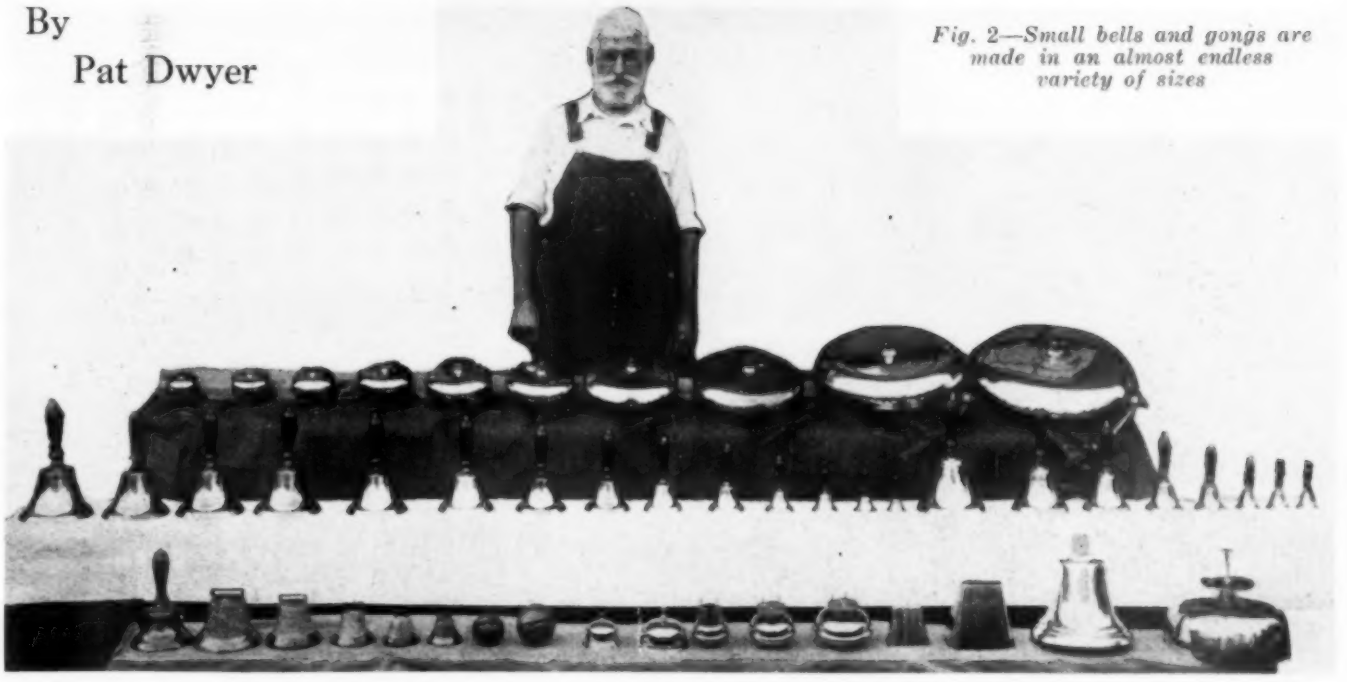


Fig. 2—Small bells and gongs are made in an almost endless variety of sizes

intrinsic value of the metal did not place it beyond the reach of the vast majority of prospective bell makers and owners.

On the fourth count Poe stumbled fairly close to the truth. Iron is used in the manufacture of bells, but these bells are not hung in steeples and they are not tolled in hollow mocking tones each time the funeral director tiptoes on a personally conducted tour through the front gate of the neighboring church yard. Every sound that floats from the rust within their throats is not a groan. Ah! No. Iron bells play a much more lowly and modest part in the universal orchestra. Suspended from a leather strap or a length of ½-inch hemp rope around the neck, they announce the location of the erring cow that has strayed from the fold. Larger bells made from the same serviceable metal are mounted on locomotives where economy

Fig. 3—Metal for the bronze bells is melted in a battery of seven coke fired crucible pit furnaces with flues connected to a wide brick stack

Fig. 4—The small crucible in a hand ladle shank easily is handled by one man

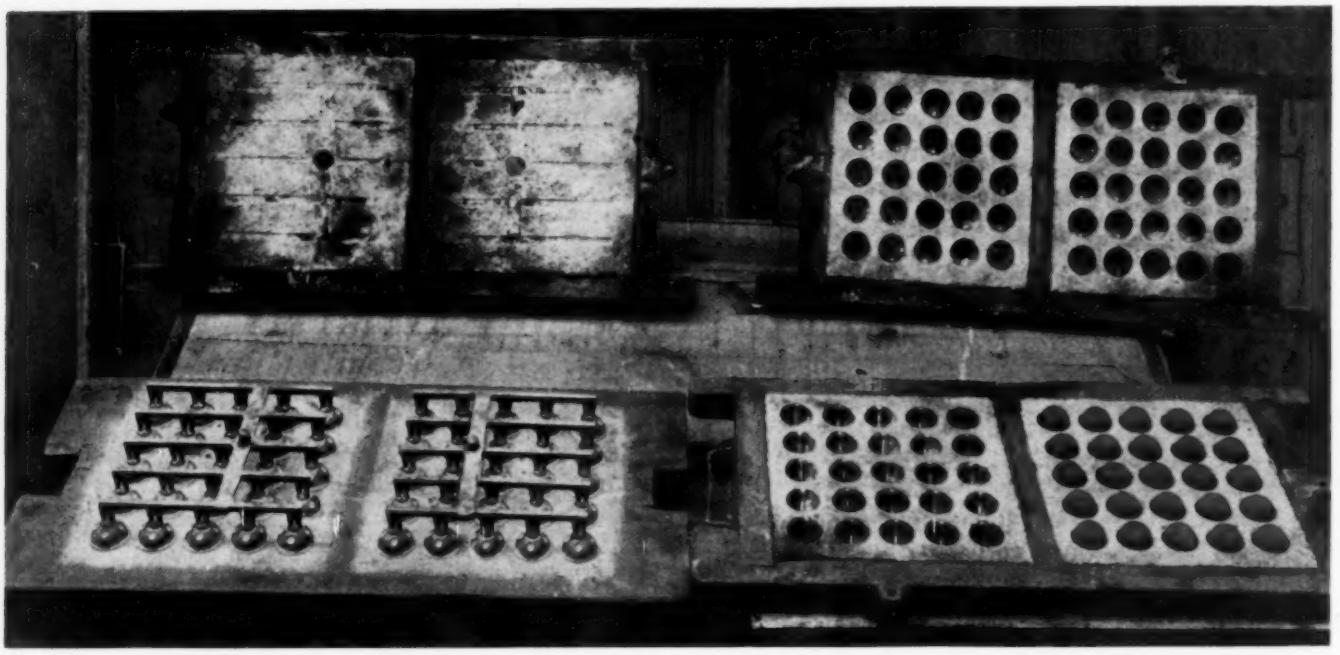


Fig. 5—The patterns and follow boards for the sleigh bells are shown to the lower left, the drag with cores in one-half to the lower right, the cheek in the upper right and the flat cope in the upper left

is the watchword and where it is claimed they give more satisfactory service than their aristocratic and shining cousins with a long and perfect bell metal pedigree.

Three generations of Starrs including the partners in the present firm, the Starr Bros., Bell Co. have made bells in the same old plant in the quiet little town of East Hampton, Conn., a secluded industrial small town in the valley of the Connecticut river about half way between Hartford and the mouth. The second part of the name is an indication of the antiquity of the place. It was settled by some of the earlist colonists from the mother land who sailed up the broad river and decided at this point to make their future home.

Perpetuate Old Names

The name also illustrates how closely related were the first pioneering bands who settled Connecticut and other New England states. Each group perpetuated the name of the old home town in the new settlement. Later when communication became more general and confusion seemed imminent over a similarity of names a compromise was effected by prefixing east, west, north or south to the original name. These various towns have nothing in common but their age and usually are separated by distances that vary from 10 to 50 miles. Some of them have yet to see a railroad.

A brief dip into the ancient annals of East Hampton shows among other things that the Rev. John Norton, minister there for 30 years from 1748 onward was one of the most famous fighting parsons of that stormy period. A graduate of Yale he had first served at Bernardston and had been taken captive to Canada. In 1755 he joined the expedition to Crown Point as chaplain.

Another point of interest is the house in which the Rev. Joel West was ordained in 1792. This still is pointed out to visitors. However, the annals of the time devote more space to his sprightly and beautiful wife Betsy. Apparently the chroniclers were justified. The lady arrived in a carriage, the first ever seen in the village. Also she had a carpet for her parlor likewise the first luxury of the kind brought into the valley. She banged her hair. She wore a red coat over a gown of changeable silk and her modish bonnet trimmed with swansdown created a sensation at the place and period. The cradle in which her 12 children were rocked still is preserved and would seem to indicate that mistress Betsy's claim to a place in the hall of fame is not based altogether on her love for a smartly cut red jacket or for the grace she displayed under the sheltering eaves of the famous swansdown bonnet. Incidentally the story seems to reflect a fair measure of credit on the skill of the honest artizan who built the sturdy and dependable cradle.

In the eighteenth century, East Hampton was a center of iron manufacturing and early in the nineteenth century factories were established for the manufacture of bells, brass kettles, pistols and irons. The brass kettles, pistols and the irons have disappeared, but the bells still are made in greater numbers than ever. There is none of the rush and hurry, the nerve and body racking strain of the big cities. Men go about their various tasks with skill and diligence, but without unseemly haste.

The spirit of the place is typified fairly in the plant of the Starr Bros., Bell Co. Highly finished small bells are shipped out daily by the truck load. The skilled old bell maker shown in the illustration Fig. 2 has been with the company for over 50 years and while none of the other employes can equal that record, still nearly every employe has been on the payroll for many years. The labor turnover is—well as a matter of fact it is stated that there is no labor turnover.

Make Variety of Bells

Business of the company always has been confined to small bells ranging is size and weight from the smallest gong and sleigh bell, to fire gongs or other form of bells with a maximum weight of 25 pounds. The list includes practically every type of small bell within these limits used in this country or abroad. A typical selection of sizes and shapes is shown in Fig. 2. A building outside the foundry is fitted with shelves for a pattern storage and contains approximately 1000 different bell patterns.

Viewed simply from a molding angle the production of bells presents no extraordinary features. The patterns are mounted on follow boards, singly for the larger sizes and in groups for the smaller sizes. For example 50 patterns are mounted on the follow

board shown to the left in Fig. 5. This illustration represents the method employed in making molds for sleigh bell castings and also shows that the idea of mass production is by no means confined to the automobile industry. At one time a set of 25 patterns was considered sufficient for a flask. Experiment showed that a mold for 50 bells could be made almost as rapidly as a mold for 25. Two sets of patterns thereupon were mounted on a single long board as shown, and a set of flasks was made to fit the board. Each group of 25 is poured through a single runner.

Molds for Sleigh Bells

On account of pouring the bells in groups, it is necessary to form the mold in a three part flask. One of the molds is shown open in Fig. 5 with the drag at the lower right, the cheek immediately above it, the cope to the left of the cheek and the follow board and patterns, as previously stated, in the lower left part of the illustration. The follow board and flask are made of wood, but the patterns and gates are made of metal highly finished and accurate. The same accuracy also applies to the coreboxes to insure an even thickness of metal in the exceedingly thin walls of the castings. A thick slab of wood is used for the follow board. Suitable openings are gouged in the surface to receive the bell patterns up to the parting line. The guide pins on the flasks are kept tight and in good trim to prevent any shift in assembling the mold parts, particularly the drag and cheek. A slight shift in the flat cope would not affect the castings.

Each little sleigh bell pattern is provided with a gap on the drag side and with three or four small indentations on the cope side. The sand which fills the gap on the bottom of the pattern serves later to support the core in the mold. The little mounds of sand formed by the indentations in the cope side of the pattern serve as chaplets to hold the core in place while the metal is surrounding it.

The automobile gradually is pushing the sleigh out of the picture, but sleigh bells still are made in considerable quantities. In an earlier day when the sleigh was almost as familiar a sight as the automobile of today, millions of boys wondered how the pellet, the clapper was placed inside the bell. The slit in a 2-inch bell usually measured ⅛-inch in width while the cast iron ball on the inside was ½-inch in diameter. Like many other mysteries the explanation is quite simple. The ball is bedded in the sand in the corebox. The core with the enclosed ball is dried and placed in the mold. After the casting is poured the sand is cleaned out through the slot and the ball remains in the inside. The cores are made from a weak mixture of old and new sand bonded with a minimum amount of binder. What little gas is generated during the pouring of one of these castings, easily passes away through the gash in the bottom which forms the coreprint.

To insure a perfect fit between the multiple gate and the group of patterns the cheek is rammed first on the board with the patterns and gates arranged as shown in Fig. 5. Each one of the bell patterns is a separate unit, but the runner for the group of 25 is in one piece. A single member extending from one side of the group to the other side connects five bars that rest on the bell patterns through small, flat parts that fork at the point they touch the patterns. A little knob on the top of the central member serves as a guide for locating the single runner stick in the cope.

This type of pattern and equipment has been in use satisfactorily for many years. If conditions warranted, if the demand for cast bells was going up instead of coming down, it is probable that a matchplate rigging would be developed by which the molds would be squeezed on a machine. It is doubtful if new equipment ever will be required for making this style of small bell. In recent years the tendency has been toward the adoption of pressed metal bells. Both steel and bronze sheets are used for this purpose. Many sizes of gongs also are stamped from sheet metal of a suitable gage. The Starr Brothers' plant is abreast of the times in the necessary equipment for making bells either by the cast or the stamping process.

If further detail on molding the sleigh bells is required it may be summed up briefly in the statement that the cheek is rammed first with the runners in place on the patterns. The cope is rammed on top of the cheek and then the two parts are rolled over as a unit. The follow board is removed and the drag is rammed. Then the three parts are rolled back to the first position. The cope is lifted, the runner patterns are withdrawn, the cheek is lifted, the bell patterns are taken out of the drag, the cores are placed in position, the cheek and cope are replaced in turn after which the mold is clamped and poured.

Describes Ancient Furnace

The same general method is employed for many of the smaller plain bells and gongs. The patterns are mounted mouth down on the follow board. Since the castings are poured in the same position it is apparent that the cope must be rammed first followed by the drag. Both parts are rolled over and then the cope and drag are separated, the patterns are removed and the mold reassembled in the usual manner. According to the foundry method of expression, the pattern leaves its own core. In some instances the patterns are mounted in such a manner that the drag may be rammed first.

The ancient furnace shown in Fig. 1 is an interesting connecting link between the past and the present. At one time all the bell metal was melted in a group of four of these furnaces located at the four base corners of a brick stack, two at the side facing the operator in the illustration and two at the far side. The rectangular arch which may be noted separating the lower part of the stack, contained a water tank for supplying circulating water to the tuyere built in the brick work at the back of each firing chamber. The system was the essence of simplicity. It had neither pumps nor valves and

(*Concluded on Page* 132)

Fig. 6—Small miscellaneous brass castings are made in snap flasks

Steel Foundry Handles Sand *Mechanically*

Wisconsin Casting Plant Employs Special Installation To Clean, Cool, Aerate and Temper Large Quantities of Molding Sand

By Brinton Welser

EVERY foundryman, at some time in his career as a manufacturer of castings, has been confronted by the problem of securing an economical method of handling the sand in the foundry. The preparation of sand for the molding process is a source of heavy expense in the foundry. This feature is true particularly when the heap sand or backing sand is milled, since in such cases an enormous tonnage of sand must be handled each month in the larger shops.

An average of 6 tons of heap sand for 1 ton of castings is considered a representative ratio of the sand necessary in the steel foundry industry. It may be seen readily from this figure that a steel plant producing 500 tons of castings in a month will handle 125 tons of molding sand each day. A situation such as this was a factor which led the Sivyer Steel Casting Co., Milwaukee to study the situation and to install equipment for handling and preparing sand mechanically.

A careful analysis of the labor required to handle sand in the steel foundry showed that 12 men were required to mill and distribute the molding sand used in the plant. The men worked in two shifts of 6 men to a shift. A study of the situation revealed the fact that not one of these men could be eliminated since the batch loading was done by hand through a loading skip.

The sand handling equipment installed in the steel foundry has reduced the handling labor required in the preparation of the molding sand from 120 to 59 hours for the 24-hour day. The reduction in the cost of direct labor alone has been in the neighborhood of $10,000 a year. Five men working days and three men working 3 hours each at night are doing the work formerly required by 12 men working full time.

Mechanical equipment for handling sand at the Sivyer plant consists of two sets of elevators, two mills and two concrete bins where the molds are dumped. Practically a separate system has been provided for each molding bay to cut down materially the distance from the molding floors to the sand handling and preparing equipment.

Progress of the sand from the molding floor through the various operations in preparing it for reuse is interesting. A row of molds set on channel skids and previously poured, is carried by a crane to one of the 100-ton dumping bins located adjacent to the sand handling plant, as shown

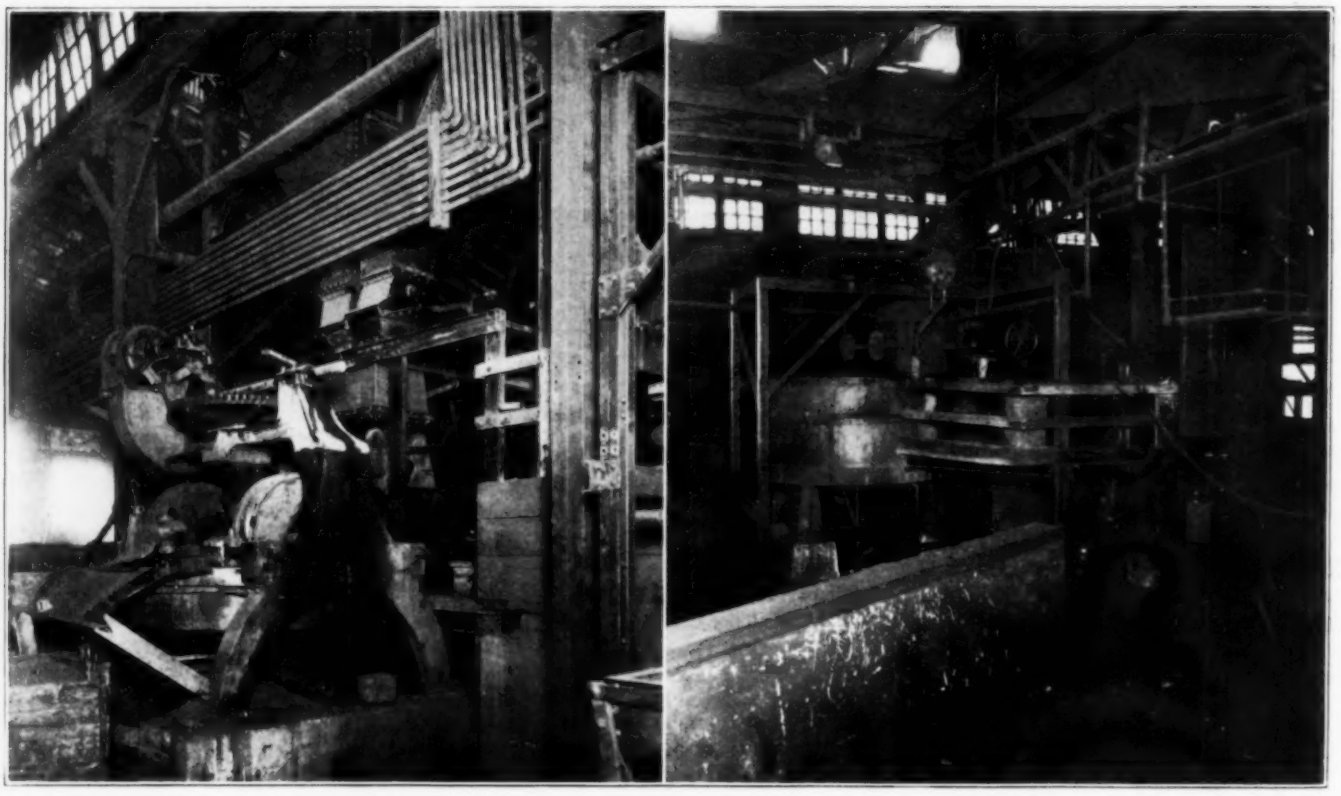


FIG. 1 (LEFT)—A CHUTE IS USED FOR DELIVERING THE SAND TO THE MILL. FIG. 2 (RIGHT)—THE SAND IS DRAWN THROUGH A GRATE IN THE FLOOR OF THE CONCRETE BIN WHERE THE LARGE PIECES OF IRON ARE REMOVED

in Figs. 2 and 5. The molds are shaken out in the concrete bin and the castings are transferred to the cleaning room. The sand then is ready to be reconditioned.

As shown in Fig. 2, the sand drops through a grate in the floor to remove many of the rods as well as the larger pieces of scrap and large sand lumps. The sand drops through the grating onto a belt conveyor feeder which is equipped with a magnetic pulley. This pulley not only removes the smaller scrap, but also salvages nails and wire. Much of this material was allowed to pass through the mill in the old method, a complete loss and a cause of considerable wear to the sand mill.

Sand is discharged from the feeder conveyor into a bucket elevator, shown in Figs. 2 and 5, and is carried to a 50-ton hopper which projects through the roof. A portion of this hopper may be noted in Fig. 1. During the process of elevating and discharging, the sand is cooled and aerated to the necessary degree. To aid this process, the top of the elevator is equipped with a ventilator.

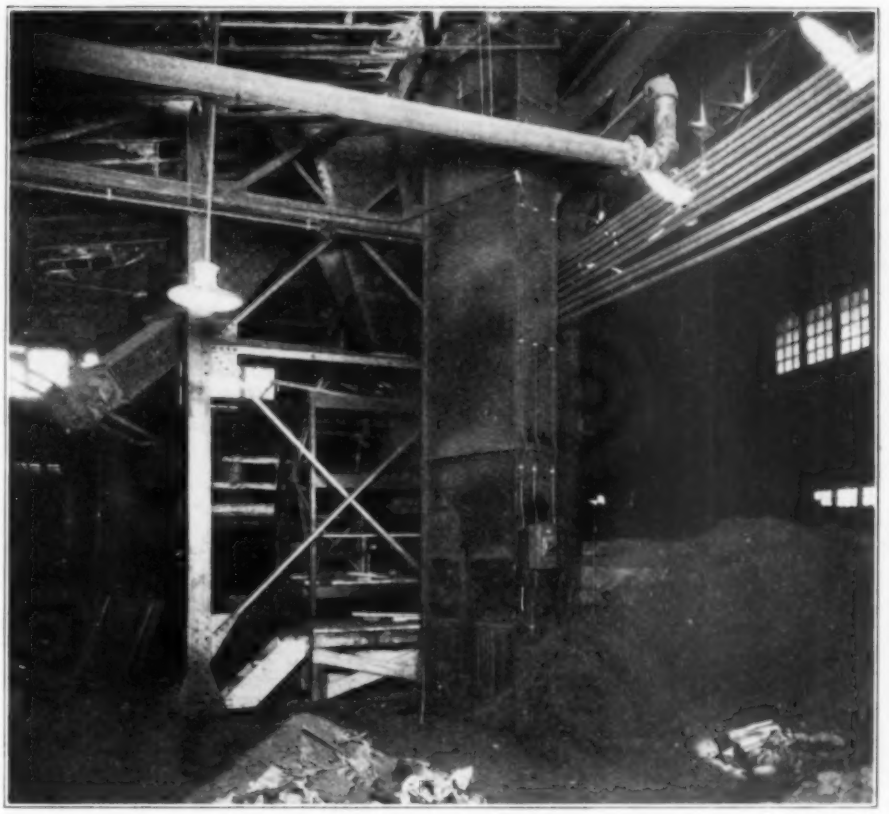


FIG. 5—SAND IS CARRIED FROM THE CONVEYOR BELT BELOW THE FLOOR LEVEL TO THE STORAGE TANK BY AN ELEVATOR

The sand then moves from the hopper by gravity, through the spouts shown in Fig. 1, and into the mills. Measuring devices, one of which is shown clearly in Fig. 3, are provided on the chutes from the hopper. These measuring devices are equipped with undercut gates which enable the mill operator to draw uniform batches of a size that experience has shown will recondition efficiently. A predetermined amount of water is added at this point by the water measuring device, which may be seen in Fig. 3.

After the sand has been thoroughly milled and properly tempered, it is spouted into electric delivery trucks, similar to the one shown in Fig. 4.

FIG. 3 (LEFT)—THE SAND ENTERING THE MILL AND THE WATER ADDED ARE MEASURED CAREFULLY WITH SPECIAL DEVICES.
FIG. 4 (RIGHT)—SAND IS HAULED FROM THE MILL TO THE MOLDING FLOOR WITH AN ELECTRIC TRUCK

The procedure described is followed in the preparation of heap sand. Another overhead hopper of 10-ton capacity is provided for new sand. When preparing facing sand the new sand is fed through the same measuring device. The same elevator which carries the used sand also handles the new sand so that a separate system is not necessary.

Several advantages, other than labor saving, have been discovered by the Sivyer Steel Casting Co., through the installation of the sand handling equipment. The quality of the heap sand has been improved. This is due to the fact that the batches mixed are of uniform size and the moisture added to each batch is uniform. A greater uniformity in the temperature of the sand delivered to the molding floor also has resulted. Excessive variations in the temperature of the sand were frequent with the old method, depending on the location from which the heap sand was loaded into the skip to be carried to the mill. Temperatures of the sand also have been reduced with the mechanical equipment since the sand is spread out over the conveyor belt, is discharged into the elevator and then is carried some distance to the top of the elevator and discharged into the overhead hopper.

Elimination of all rods, nails and other metal is of considerable benefit. During one month of operation the salvage amounted to a little less than 23,000 pounds of iron and steel. Due to a better quality of heap sand, the amount of new sand required per ton of castings has been reduced approximately 50 per cent. An additional advantage has been found in having the bulk of the sand prepared during the day, when it is wanted most and when it may be prepared and distributed under closer supervision.

The system was designed and built by the Chain Belt Co., Milwaukee.

Book Review

Tables Annualles de Constants et Donnees Numeriques, Art de l'Ingenieur et Metallurgie, edited by L. Descroix, 250 pages, paper bound, 8½ x 10½ inches, published by Gauthier-Villars et Cie, Paris, France, and supplied by THE FOUNDRY, Cleveland, for $4.00, and in London, 2-3 Caxton House Westminster, for 20s. Cloth binding, $5.00 or 25s.

Engineers and metallurgists will find of great importance, this new sectional volume on engineering and metallurgy which has been abstracted from Volume V of the Annual Tables of Constants and Numerical Data, and contains chemical, physical and technological constants and data. This compilation contains data presented in various technical papers and publications from 1917 to 1922 inclusive and is published under the patronage of the International Research council and the International Union of Pure and Applied Chemistry by the International committee. The book is divided into two sections; one being devoted to engineering and the other to metallurgy. The first section deals with the mechanical and thermal constants of engineering materials. The metallurgical section contains such data as critical temperatures and zones, composition, density, transformation points, corrosion, etc. of metals and alloys. Also the mechanical, electrical and magnetic constants of ferrous and nonferrous materials are presented. This publication is printed in French, and has an index printed in German, English, Italian and French.

Welding Society Expands

At a meeting held recently at McGill university, Montreal, Que., a Canadian branch of the American Welding society was organized with approximately 90 members. Temporary officers were elected and plans laid for the future. F. M. Farmer, president of the American Welding society in a communication, stated that if three Canadian branches were formed, a Canadian division would be set up with representation on the board of the parent organization.

Publishes Sand Booklet

That a charm and a romance rest in the mining, preparation, marketing and use of silica sands, is disclosed in a book, "The Silica Sands of Ottawa" by J. Jay Fuller, just published by the Ottawa Silica Co., Ottawa, Ill. It covers all phases of the use of industrial sands. One important feature is the study of the geology of the sands of Ottawa and La Salle counties, Ill. The chapter on mining and preparation of industrial sands for marketing presents some interesting lights on refining processes and on the washing and drying these particular sands. Uses to which they are applied in an industrial way, including building, stone sawing, steel foundry sand, refractory brick, glass, abrasives, chemical industry, use as a standard sand, etc., are described. Copies may be obtained from the Ottawa Silica Co.

Society Reviews Year

To give its membership some idea of the accomplishments of the past year, the American Society for Testing Materials has published in its *Bulletin* for January a review of all activities during 1926. The society now has 2100 members serving on 45 committees and 36 of these committees reported at the last annual meeting. New tentative standards submitted in the last year were 54, making the present total of standards and tentative standards, 447. New members elected during the year were 537, while the net increase was 271, giving a membership on Dec. 31 of 4135.

Although in the past, the *Bulletin* has been published four times a year, during 1927, six issues are to be published and will be a minimum of eight pages in size. Announcement has been made that the spring group committee meeting of the society will be held in Philadelphia, March 15-18. An eastern city was selected because the annual meeting this year will be held at French Lick Springs, Ind., June 20-24.

Crane Institute Meets

A committee of the recently organized Electric Overhead Crane institute held a meeting at the Old Colony club, Cleveland, Jan. 18, to discuss policies and program of the organization. Only members of the institute were in attendance. The membership of the institute includes 11 of the country's leading manufacturers of overhead cranes and practically the industry's capacity.

Name Authors To Present Annual Exchange Papers

The American Foundrymen's association has named the authors who will present the annual exchange papers which will be contributed to the 1927 European foundry associations' meetings. James T. MacKenzie, chief chemist, American Cast Iron Pipe Co., Birmingham, Ala., will contribute a paper at the next annual meeting of the Institute of British Foundrymen; Jesse L. Jones, metallurgist, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., will contribute a paper at the meeting of the Association Technique de Fonderie de France, and O. W. Potter, engineering college, University of Minnesota, Minneapolis, will contribute a paper at the March meeting of the Association Technique de Fonderie de Belgique.

Finds Modern Foundries IN FAR AWAY AUSTRALIA

By H. P. Kreulen

THROUGH the trifling accident of birth, my wife became a native of Sydney, Australia. Many more important events have happened to her since, for example her marriage to an American citizen at a period when the ceremony conferred citizenship. Notwithstanding her long residence in this country and the interests one naturally acquires in a home over a period of many years, she always cherished an affection for her childhood home and cultivated a hope of seeing it again.

She did not take the traditional method of brooding over her longing in secret, of letting it gradually sap her vitality. No slowly spreading canker of grief and discontent disturbed the serenity of her days and no flood of briny tears ruined her freshly ironed pillow covers at night. Not at all. In her practical matter of fact manner she announced one

day that as soon as the savings account would stand the strain she intended to visit the old home. She generously included me in the general scheme and there you have the entire preliminary to our pushing off from Vancouver, B. C., on Dec. 16 a year ago for a three month trip to the island continent regarded from these northern latitudes as beneath and beyond the rim of the world.

The total distance is almost 9000 nautical miles equivalent to approximately 10,000 statute miles and the total one way time is 24 days, but the journey by no means is as monotonous as might be inferred from these figures. The steamer stops at three way stations or ports of call on the way down. Honolulu, Suva and Auckland. The first is in the Hawaiian Islands, or to be exact on the southern side of the island Oahu, third in point of size but first in importance in the group. Honolulu is the commercial, as it almost is the geographical center of the Pacific, the great cross roads where all the principal steamer and sailing ship routes of the vast ocean meet.

The average citizen whose early and

Extremely long floors readily are adapted to the use of traveling sand throwing molding machines. This bay is devoted exclusively to bath tubs

perhaps sketchy geographical knowledge has been smothered in the tares of later life, popular music, movies and other references which indicate that the natives of Hawaii are clothed scantily in a few wisps of grass and a bouquet, is due for a surprise. Popular fancy pictures Hawaii as a cute little island located somewhere in the South Seas, peopled principally by a race of beautiful brown maidens scantily attired, who alternate their waking hours between daring exhibitions of surf riding and playing some soulful and catchy melody on a ukelele under the witching spell of a tropical moon. A coral beach pure and white as Arctic snow encircles the translucent, sapphire waters of the lagoon in which the feathery fronds of the palms and coconut trees are reflected with photographic intensity.

Recounts Information

H P. KREULEN, widely known among American foundrymen as a representative of the Bethlehem Steel Co., Bethlehem, Pa., has enjoyed a cosmopolitan experience. After learning his trade in Holland, he came to America, was a foundry executive for a time and then was employed by the Charles C. Kawin Co., Chicago until he took up his present position. Mr. Kreulen's trip to Australia last year developed some interesting information on life on the other side of the world, which he recounts in the accompanying article.

North of the Equator

As a matter of fact there is about as much romance connected with living conditions in the group of eight islands comprising the Hawaiian group as there is in Hartford, Conn., or in Hannibal, Mo. Instead of being located in the South Seas as per popular supposition the islands occupy a position north of the equator, quite a distance north. To be exact they lie between the parallels of 18 and 22 north latitude and between 154 and 160 west longitude.

A reciprocity treaty with the United States in 1876 led to an enormous development of the sugar export trade. Since that time and particularly since Hawaii became recognized officially as a territory of the United States, trade has been stimulated to a remarkable degree in such unromantic and prosaic commodities as molasses, rice, wool, tallow and bananas.

On the chart the distance between Honolulu and Vancouver is given as 2349 miles. As a result of the well known Anglo-Saxon stubbornness in setting up a multitude of individual standards and then refusing to change them, the nautical miles exceeds the land mile by 800 feet. This little item increases the total distance by 356 miles. We arrived in Honolulu on schedule time, the day before Christmas and eight days out of Vancouver.

They Lose a Day

The second stage of the journey, from Honolulu to Suva in the Fiji Islands, is the longest of the four, approximately 3000 miles. Also it is the stage on which travelers going westward lose a day without even a "By your leave." For example we crossed the international date line the night of Dec. 31 and found that the following day was Jan. 2. Although this practice is extremely confusing to any person who has not studied the subject, the explanation is simple and has no connection with the hilarious party with which the ship's company celebrated the passing hours of the old year.

The international date line extends through the Pacific from the North to the South Pole and approximately

Two of the four cupolas in the plant of Metter's Limited. Note the double spout arrangement and the special chain hoist for raising the drop bottom doors

close to the 180 degree of longitude. In other words exactly half way round the earth from the line extending through Greenwich, in England where time for purpose of reckoning position begins and ends.

Travelers who have crossed continental United States are familiar with the system by which the territory is divided into four time zones, eastern, central, mountain and Pacific. To be strictly accurate the time should show a slight variation with every mile, but that idea is impracticable. Four arbitrary divisions have been established in each of which the time is uniform and differs by one hour from the time recognized in the division on either side.

Not a Straight Line

The almost innumerable islands in the southern Pacific have been grouped and segregated in a somewhat similar manner for the purpose of reckoning time in the general vicinity of the 180 parallel of longitude. For practical purpose all the islands on one side of the line reckon time from the east while all the other islands reckon time from the west. For example in the Phoenix Islands, Union group, Pago Pago and Tonga islands, Monday (or any other day of the week) is Monday as it is in the United States. The same day is known as Tuesday (with a corresponding shift in the remaining days of the week) in the Fiji and Ellice islands, the Gilberts, the New Hebrides and the Solomons and corresponds to the day observed in Australia, the Philippines and Asia.

By way of digression, merely as a point of academic interest and also illustrative of the manner in which the international date line is manipulated to suit special conditions, attention is directed to the manner in which it is bent in a large *V* at the entrance to Behring sea. At this point the Aleutian islands extend like the skeletonized tail of a prehistoric monster from Alaska to the main land of Asia. The line deviates more than 10 degrees to the west so that the time on all these islands will be reckoned as it is in America. Higher up the line swings 10 degrees or more to the other side of the 180 parallel to avoid passing through the most northerly and eastern tip of Asia which in the locality of Behring strait approaches closely to Alaska.

Probably that is sufficient about the international date line. It is an important institution and no doubt serves a useful purpose for those who go down to the sea in ships and venture over the great waters of the Pacific. However, it plays little part in the lives of the majority of the earth's inhabitants. Judging by my own experience its application is decidedly hard to understand. With your permission we'll leave it astern and steam into the harbor of Suva, the principal town in the Fiji islands.

On account of the different scales to which maps are drawn and the national pride through which the map maker's native land is the only one shown in proper focus, the average person acquires an extremely hazy and minimized idea of relative distances in foreign countries. A casual glance at a map of the south Pacific would seem to indicate that Auckland, New Zealand, is only a hop step and a jump from Suva in the Fiji islands. It is a matter of common but decidedly faulty knowledge that Australia and New Zealand lie close together, practically cheek by jowl.

As a matter of fact the distance from Suva to Auckland is 1140 miles. Still another stage of 1300 miles separates New Zealand from Australia. A one day stop at Suva affords an opportunity of riding around the island and a two day stop in Auckland furnishes an excellent opportunity for viewing the city whose suburbs particularly are gorgeous with flowers at this season. Seasons are reversed at the antipodes. Australians and New Zealanders are in full enjoyment of summer during the season we have our heaviest coal bills. Imagine Christmas day with the thermometer between 90 and 100 degrees, with the bathing beaches crowded and with the inhabitants getting by with clothing of minimum weight and volume.

Sydney, the capital of New South Wales with a population of 1,000,000 is the largest city in the commonwealth, but is pressed closely for place by Melbourne in the neighboring province of Victoria. Remarkable growth of these and other cities has taken place practically within the memory of men still living.

Soft velvet stars of the southern cross looked down for centuries upon a land so isolated and considered so worthless that England at one time used it as a penal settlement. The same constellation now shines nightly on one of the most modern and enlightened countries on the face of the earth and one of the brightest jewels in the world embracing girdle of the British Empire.

Time was when the name Australia suggested a country sparsely settled by kangaroos, convicts, boomerang throwers and bush rangers. Those days have gone and now the great island continent counts its inhabitants by the million where once they were counted by the dozen.

Owing to its position Australia was obliged to import nearly everything required over a period of many years. Gradually, the country has been developing its own resources and building its own manufacturing plants. Taking the foundry industry as an example the latest survey shows nearly 300 foundries operating inside the boundaries of the commonwealth. On a per capita basis this means that it has a foundry for every 23,000 people, as compared with the United States where a foundry exists to meet the requirements of every 18,000 people.

A more accurate comparison might be secured by contrasting the tonnages of castings produced, but unfortunately these figures are not available. However, from the preceding paragraph it is apparent that the foundries of Australia in number and capacity are equal to all demands for castings. Two views of the interior of the Sydney foundry operated by Metter's Ltd., are shown in the accompanying illustrations.

Meter's Ltd. is one of the largest and most progressive manufacturing companies in Australia. In its own particular line it is the largest. The company manufactures gas, wood and coal stoves and appliances, bath tubs, sinks and other porcelain enamel ware, bath and service heaters, aluminum and enameled hollow ware, windmills, pumps, troughs, soil and rainwater pipes and many miscellaneous lines.

Extensive plants are operated at Sydney, New South Wales; Adelaide, South Australia and Perth, Western Australia. Agencies are maintained in the principal countries of the world.

The principal plant located at Alexandria, a suburb of Sydney, New South Wales, gives employment to approximately 1500 people and covers an area of 15 acres. To provide for anticipated further extension the company recently has acquired additional 52 acres.

Use Australian Pig

The foundry occupies an area 300 x 480 feet divided into twelve 40-foot bays each 300 feet in length. Pit ponies are employed to transport all kind of materials, molten iron, flasks, castings, sand, etc., from one point to another over a system of light railroad tracks. Four cupolas lined to 66 inches and used in pairs on alternate days, melt all the iron required. During the past nine years the daily tonnage has increased from 10 to 60 tons. Native Australian pig

iron is used and melted at a high temperature to meet the exacting requirements of the classes of castings referred to in a preceding paragraph. Castings made here compare favorably with those made either in America or Great Britain. The cupolas are located centrally at one end of the foundry and immediately adjacent to the stock yard. They are served by two 3-ton electric jib cranes which deposit the pig iron, scrap and coke on the charging floor in front of the charging doors.

Bath tubs exclusively are made in three bays of the foundry which are equipped with special equipment including six sand throwing machines made by Beardsley & Piper Co., Chicago. Each machine rams 40 complete molds per day. Other special equipment in this department includes six 3-ton and two 5-ton electric cranes, pneumatic molding machines, hoists and vibrators.

Castings are cleaned in a battery of 24 tumbling barrels piped to a satisfactory dust collecting installation. Larger castings are cleaned in four sandblast rooms supplied by the Pangborn Corp., Hagerstown, Md., which are equipped with automatic sand conveyors and with individual dust extracting and arresting units.

Compressed air to operate the sandblast, portable grinders, molding machines, vibrators and hoists is supplied from a reservoir 6 feet diameter, 30 feet in length charged at a pressure of 100 pounds per square inch by four compressors driven by motors totaling 300 horsepower.

Bath tubs are enameled in six muffle furnaces located in a special department 250 feet in length. An efficient ventilating system is provided capable of renewing the entire air supply of the room four times per hour. Furnaces and plant are of the latest design and are capable of turning out 200 tubs per day in addition to large numbers of basins, sinks, and a full line of general sanitary ware. Either in surface finish or utility it is claimed these good compare favorably with anything imported.

Recently a new wet process of enameling after the American fashion has been installed for finishing light castings. Adoption of this method involved a considerable extension to the existing enameling shop, three enameling furnaces with speed forks and special oil burners, and special spraying equipment. Melting and grinding shops where the enamel is prepared are light and airy and efficiently ventilated by exhaust fans. The frits are melted in seven furnaces and the material is ground in seven pulverizing cylinders, three 6 feet diameter and the remaining four a smaller size.

Four years ago the company installed equipment and began the manufacture of aluminum and enameled hollow ware and rapidly built up a trade that calls for the production of 50,000 articles per week. Special equipment in this department includes latest type stamping presses, electric welding and seaming machines, open flame melting furnaces, oxyacetylene welding outfit, oil fired enameling furnaces, fritting furnaces and pulverizers. The department includes a tool making shop, a stamping shop, foundry, welding shop, bakelite plant, spinning and polishing shop and enameling shop.

Other associate departments of this extensive plant include a large and well equipped pattern shop, brass foundry, brass finishing shop, copper shop equipped with heavy duty presses for stamping wash boilers and a bath heater department. The shipping department known by the English title of delivery and despatch department is served by a fleet of 5-ton motor trucks.

Enterprising policy of the company interpreted by R. A. Spring managing director, is shown in the encouragement given department managers to improve the output by the installation of latest equipment and methods. A few years ago a number of the principal officials toured industrial United States inspecting and studying American methods.

Ancient Art Perfected in Eastern Shop

(*Concluded from Page* 125)

depended on two of nature's laws, gravity and expansion, for its successful operation. The water flowed down through one pipe by gravity into the tuyere. Expansion due to the heat drove the water back into the tank through a second pipe. Simple, positive, reliable involving neither attention nor expense.

Occasionally the cast iron tuyere developed a leak and had to be replaced. Other equipment required for melting the metal in one of these furnaces included a wrought iron or steel ring about 12 inches in diameter with a short goose neck handle, a 3-foot length of 2-inch pipe to slip over the end of the goose neck to serve as a handle, in the lifting the molten metal, a shallow clay dish or crucible a truncated cast iron cone to support the crucible in the fire and a steel half circular baffle plate to confine the flame around the graphite crucible.

In practice the cone is placed on the clean hearth and surrounded with charcoal. The crucible is placed on top and filled with charcoal. A layer of metal is placed on the charcoal followed by a second layer of metal and charcoal and so on until a sufficient amount of metal is charged to fill the crucible in a molten condition. The fire is lighted and soon raised to a fierce heat by a mild blast from a small fan. The steel baffle plate confines the heat closely to the vicinity of the crucible and the metal rapidly melts and trickles down. It is claimed this method exerts a refining influence on the metal, removing all the zinc and part of the tin, and thus renders it particularly applicable to the reduction of miscellaneous brass scrap. With knowledge gained through many years of practical experience the melter anticipates the loss of elements from any given charge of scrap. He makes any necessary additions of new metal to bring the alloy up to the required standard. Composition of bell metal varies from 80 to 90 parts copper with tin from 10 to 20 parts.

Scarcity of charcoal and advance in price gradually has displaced the foregoing method of melting in favor of the battery of seven coke fired crucible pit furnaces shown in Fig. 3. Each crucible holds approximately 50 pounds of metal and may be readily handled by one man. The closed molds are placed on long stands 6 or 8 inches above the floor level to facilitate pouring the metal from the crucible held in an ordinary hand ladle shank. Iron weights for the copes are made from a large rectangular bell pattern. In this instance the core was removed after the mold was made resulting in a solid block of iron the size and shape of the bell and with the loop in the top as usual. A limited amount of light jobbing work is handled in addition to the regular and extensive line of bells.

Visit Laboratories

Recently the members of the Birmingham, Coventry and West Midlands branch of the Institute of British Foundrymen visited the newly opened laboratories of the British Cast Iron Research association in Birmingham. The laboratory occupies a two-story building. On the lower floor are the library and information bureau and the microscopic laboratory. A well-equipped chemical laboratory occupies the second floor. The building also contains a machine shop for preparing specimens for the various tests which are made.

Convention City Leads as a Foundry Center

Reproduction of the Cover of the Official Invitation To Meet in Chicago Which Was Extended to the American Foundrymen's Association by the Chicago Association of Commerce. The Sketches Show the Tribune Tower, the Straus Building, the Wrigley Tower, the Chicago Temple, the London Guarantee Life, the Field Museum, the Soldiers Field Stadium and the Jewelers Building

CHICAGO INVITES YOU

CHICAGO, the center of interest for American foundrymen in 1927, is the first city to act as host on four different occasions to the members of the American Foundrymen's association and is the only city which has been honored with the convention two years in succession. The first Chicago convention was held June 5 to 7, 1900, five years after the founding of the association. The second meeting in the Midwestern metropolis was held in 1913 and the third in 1914. The headquarters of the association has been located in Chicago for a number of years.

In selecting Chicago as the meeting place for the thirty-first convention, the board of directors of the American Foundrymen's association creates the opportunity for foundrymen to visit the largest foundry center in the United States if not in the world. During the 27 years since the first convention in that city, the growth in the number of foundries and the value of products produced in Chicago has been remarkable. According to the latest reports, 204 foundries now are located within the city limits, or 79 plants ahead of the nearest competitor.

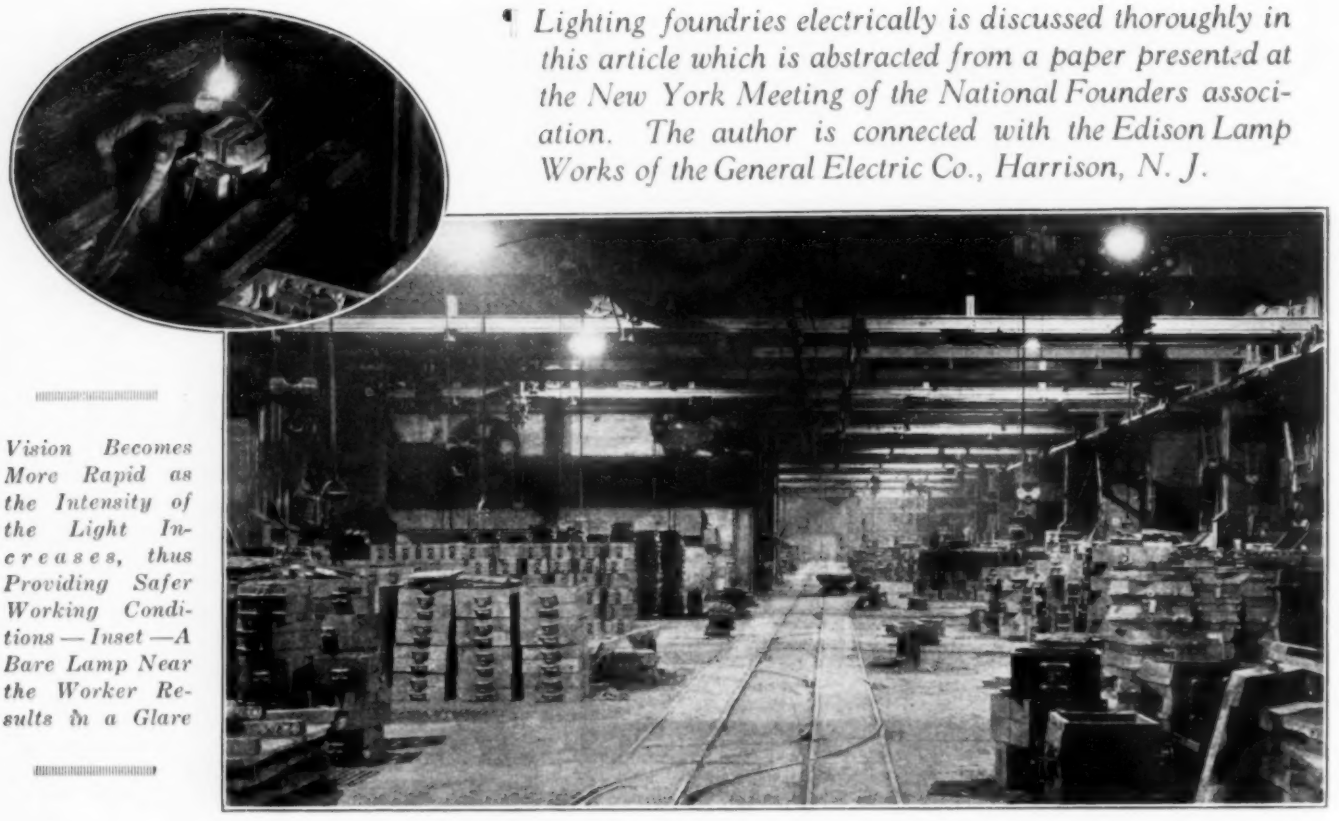
However, the foundries in the towns comprising the metropolitan area must be considered to secure a clear idea of the extent of the foundry business in Chicago. Plants are distributed in the territory embraced within the Chicago Outer Belt Line railroad, including Waukegan on the north, the Fox river on the west and Gary on the south, as follows: Chicago, 204; Evanston, 1; North Chicago, 3; Waukegan, 4; Elgin, 2; St. Charles 4; Geneva, 3; Batavia, 8; Aurora, 6; Joliet, 7; Harvey, 5; Chicago Heights, 6; Indiana Harbor, Ind., 2; Hammond, Ind., 6; East Chicago, Ind., 6; Gary, Ind., 2. This gives a total of 269 foundries in the metropolitan district.

Chicago's pre-eminence as a foundry center may be due to its location at the natural cross-roads between the industrial East and the agricultural West, the ore producing North and the cotton growing South. The city is situated in the center of a great iron and steel district. It is the greatest railroad center in the world and the home of a large number of railway supply concerns. Ten per cent of the foundry and machine shop products of the country come from within the city limits. A large tonnage of the castings produced is used in the manufacture of agricultural implements and special machinery, and castings are shipped in quantities to consumers in the surrounding states.

Although a few companies in the Chicago district make some fairly large castings, the district as a whole does not specialize in this line of work, as is the case in the neighboring city of Milwaukee. The demand in Chicago is confined chiefly to medium and small castings, and the tonnage of small castings produced exceeds that of any other market. It is interesting to note that in the Metropolitan district, gray iron is poured in 121 plants, steel in 15, malleable iron in 11, brass in 132 and aluminum in 98. Pattern shops are maintained by 124 plants and machine shops by 125.

Concentration of foundries in Chicago and the diversification of products will make it possible for foundrymen attending the convention to see practically any type of work in progress. In the near future the plant visitation program will be announced. The trips will be arranged to enable the interested foundrymen to obtain an accurate cross section of the foundry industry in Chicago.

¶ *Lighting foundries electrically is discussed thoroughly in this article which is abstracted from a paper presented at the New York Meeting of the National Founders association. The author is connected with the Edison Lamp Works of the General Electric Co., Harrison, N. J.*



Vision Becomes More Rapid as the Intensity of the Light Increases, thus Providing Safer Working Conditions — Inset — A Bare Lamp Near the Worker Results in a Glare

The Molder Needs Light *To Work Efficiently*

By W. H. Rademacher

DESPITE the great progress, which has been made during the past 20 years in introducing machine methods in foundry operation, the human element still is most important and enters into the execution or control of practically every operation. Foundry efficiency, or more simply expressed, successful foundry operation, is contingent upon human efficiency and human efficiency in turn is dependent more upon sight than any other element.

In setting a pattern, ramming a mold, drawing a pattern, touching up, pouring, chipping, grinding, sandblasting or inspection, the quality of product and its speed of production, depend upon the worker's ability to see accurately and rapidly. In moving from place to place and in carrying on routine operations, the worker's clearness of vision warns him of danger and insures his safety.

Obviously in darkness vision is impossible. With increasing quantities of light vision becomes clearer and more rapid so in the last analysis sureness in the foundry is dependent to a marked degree upon light. Recognition of this fact is evidenced in building construction, provision for the entry of daylight being made in the form of windows and in modern plants by vast skylight areas. However, daylight, is exceedingly inconstant in value, ranging from a maximum at noon on a bright, sunshiny day to total darkness on a cloudy night. Even daytime atmospheric conditions are so variable, and in many cases building construction is such, that despite the provisions made for natural lighting, some means of artificial illumination becomes necessary.

For example, in the vicinity of New York approximately 142 days a year are cloudy. Artificial light must be used to supplement or replace daylight, on the average of about two hours per day throughout the year, even in the plant well designed for the admission of daylight. Where the plant is operated at night, the demand for artificial light is greater.

Such being the case, the importance of providing artificial light is not to be doubted. The foundryman is not faced with the question of whether artificial light is necessary in the foundry, but rather of what type, how much, and how artificial light should be applied.

The low initial and maintenance cost, the ruggedness, efficiency, and ease of control of the incandescent electric lamp have quite naturally led to its standardization for foundry lighting duty.

Despite this universal usage, application is not universally correct nor can it be said when speaking of the foundries in the United States, that the average foundry is well provided with artificial lighting. As a matter of fact, it is very doubtful if more than 15 per cent apply artificial light in such a manner as to derive its benefits most economically.

There is a tendency to overlook obsolescence and an apparent failure to appreciate the economic advantages of modern lighting equipment

and methods. Under favorable daylight conditions it is not unusual to find natural lighting intensities ranging from 20 to 50 or more foot-candles throughout working areas. Yet in the same plant with the coming of darkness it is not infrequent a maximum of 1 or 2 foot-candles of artificial light is found, and that poorly distributed and inefficiently obtained. Often lamps are so applied as to be exceedingly glaring. The evils of such practice are not to be treated lightly.

With an adequate intensity of light the eye sees more rapidly and more accurately than when low intensities are applied. This may be illustrated readily by a demonstration. It has been proven conclusively that by increasing the intensities of light used for typical foundry operations, production may be increased. This may be attributed to the more rapid physical response which comes with quickened vision, the reduction in spoilage which comes with more accurate vision, and the mental alertness and high morale which comes from a bright and cheerful atmosphere.

Just so long as the value of such production increase is greater than the cost of the lighting which makes it possible, it is economically desirable to elevate lighting standards. While the production which may be obtained is contingent on the character of product and numerous variables, careful analysis leads to the recommendation of the following minimum standards of economic lighting:

Recommended Intensities

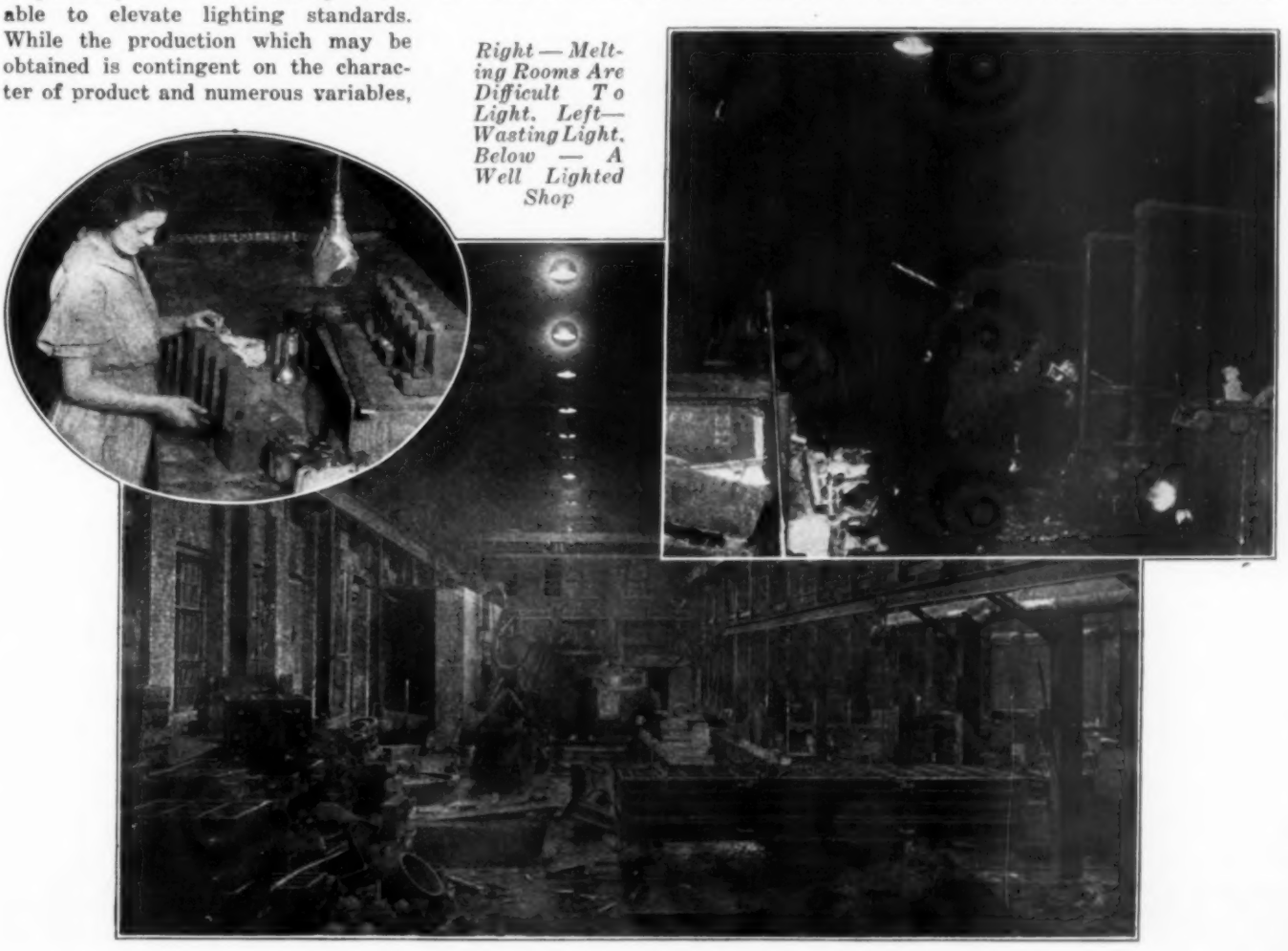
Class of work	Foot candles
Charging furnace	5
Floor molding and core making	6
Bench molding and core making	10
Casting, shakeout	5
Cleaning, chipping, tumbling	5
Annealing	5
Raw stock storage	1.5
Pattern storage	3

In applying incandescent lamps to obtain these intensities, it is essential to bear in mind that the lamp is essentially a producer of raw material —light which must be placed and controlled properly to be most effective. The management of many foundries often in their desire to provide higher intensities, and even in plants where this factor has received no consideration, apply lamps in such a manner as to create a condition which is described as glare, and undoubtedly is one of the greatest evils known to the art of illumination. Glare is misplaced light. It is not, as sometimes described by the layman, too much light. Glare is prevalent in many underlighted plants. In fact, glare and underlighting seem to go hand in hand.

Filament of any incandescent lamp is much too bright, too dazzling, to be viewed directly at close range. A lamp located so that its filament is visible from ordinary positions of observation actually destroys vision, induces eyestrain, and is a constant menace to safety. This is readily demonstrated.

A workman looking at such a light source temporarily is blinded. In attempting to move about after such an exposure, he is likely to come in contact with moving machinery or hot metals, or stumble over unseen materials. Many accidents which may be traced to this cause and to inadequate intensities are on record. The value of human life is too high and the cost of good lighting with its manifold advantages too low to justify the existence of such conditions. Providing, without glare, the intensities listed in the forgoing table will represent handsome safety insurance, for more light is essential to economical production than for the prevention of accidents. Thus, to light for efficent operation means automatically lighting for safety.

Use of bare lamps also is to be discouraged from the standpoint of operating economy. Nearly half of the light generated by a lamp filament goes above a horizontal plant through the filament. With a means of re-



Right — Melting Rooms Are Difficult To Light. Left— Wasting Light. Below — A Well Lighted Shop

directing, this upward light may be employed usefully.

Protection from glare and the control of light rays may be accomplished readily by the application of reflectors. In the selection of reflecting equipment for foundry lighting, as in the case of other apparatus, the requirements of durability, efficiency and ease of maintenance should be borne in mind.

Experience has proven that steel reflectors having a porcelain enameled reflecting surface usually are most satisfactory, while in some cases prismatic or mirrored glass units are well adapted. Such equipment is impervious to the action of corrosive fumes which arise from certain processes. Equipment having aluminum or paint finished reflecting surfaces is unsatisfactory, due to its rapid discoloration and depreciation. The dome type porcelain enameled reflector provides a good spread of light and cuts off the direct rays from the lamp filament so that the source cannot be seen from ordinary positions.

Prismatic and mirrored glass reflectors find usage where units must be mounted high, and where a concentrated distribution of light is desirable. For low mounting the deep bowl porcelain enameled reflector is advisable because of the sharper cut-off and better eye protection which it affords. Frequently where buildings are narrow, or where high intensities are required on the vertical, angle type reflectors are found advisable.

Distribution of light over working areas is governed largely by the placement of the lighting units. In the early days of incandescent lamp application, it was quite usual to find the foundry illuminated by lamps on drop cords—one at each working position but few, if any, elsewhere. A bright spot of light here and there surrounded by gloom and harsh shadows, a condition which has been humorously termed *distributed darkness*, prevailed. The worker's eye as it moved from place to place encountered widely varying intensities demanding constant readjustment and resulting in rapid eye fatigue and uncertain vision. The lamps, being within the reach of the workers, were shifted about, easily sometimes to the advantage of one worker, but more often to the discomfort of his neighbor.

Theft and breakage were high and wire troubles were common. Lighting of this type still is prevalent to an unfortunate degree in many plants. Modern practice, however, favors the use of what is known as general lighting. While this method is not universally applicable, it is undoubtedly most effective and economical for the majority of foundry operations such as furnace charging, average floor molding, casting and shaking out, cleaning, chipping, tumbling, annealing and storage.

It consists of the mounting of units overhead. Insofar as possible the units are arranged symmetrically to produce approximately uniform illumination throughout a given area. Under such lighting a workman may move from place to place with clarity of vision and physical safety. Dark spots are eliminated and shadows minimized.

This method of lighting, while having none of the disadvantages of local lighting, has the further advantage of lower installation cost and greater efficiency. Fewer outlets are necessary to light a given space and one large lamp of high unit efficiency may take the place of a number of small lamps of relatively low efficiency. For example, in a local lighting system we might find four 50-watt lamps being used to illuminate certain work. Four such lamps at 27 cents would cost $1.08. Four such lamps, each giving 520 lumens or units of light, would give a total of 2080 units of light. One 200-watt lamp, a single unit consuming the same energy as the four smaller ones, would cost 80 cents, and would give 3200 units of light. The single unit, in other words, would represent a saving of 26 per cent in initial lamp cost

It Is Economically Desirable To Elevate Lighting Standards as Long as the Value of Production Increase Is Greater than the Lighting Cost

with an increase of illumination of 53 per cent. In addition there would be a substantial saving represented by a much lower reflector, outlet, wiring and maintenance cost.

In such operations as bench molding, machine molding and core making of small parts, it sometimes is preferable to employ what is known as localized general lighting. This is essentially the same as general lighting except that the lighting units are located or offset from symmetry with reference to the position occupied by the machines or benches so as to produce a maximum intensity and preferred direction of light over working areas.

Local Lighting Used

Local lighting, that is units mounted low and directly at the work, finds justification only in the preparation of molds which are deep and narrow, as for example, the mold for casting a gear case which might be a foot deep and ½-inch or less thick. After drawing the pattern it is of course necessary to see clearly inside of the mold to mend broken places and clear away any possible projections, loose sand, etc.

In some plants it is not unusual to see a molder manipulating a pocket mirror trying to pick up a beam of light and throw it into the deep part of the mold. Adequate artificial light is essential to such inspection. Ordinary overhead lighting, regardless of its intensity, cannot be made to penetrate to a sufficient depth and a local light, which may be placed close to the point of inspection, is imperative. However, this should not take the form of a bare lamp but rather a small lamp of, say, 25 watt size equipped with a small deep bowl steel reflector, which will throw light into the mold and shield the worker's eyes. These units must be located so as to offer no interference with crane operation.

If the lighting unit must be portable to accommodate shifting working positions, and if conductors must be run across the floor and are likely to be walked on, they should be of the armored type. If feasible, it is desirable to employ an automatic reeling type extension which will keep the conductors and lamp out of harm's way when not in use.

Another effective scheme for providing a high intensity of local light over a small area is to employ a bridge lamp, an iron upright with a heavily weighted base and adjustable bridge or arm at the top carrying a deep bowl steel reflector. This may be located at the working position. Any such schemes of local lighting should be considered merely as a supplement to a system of general illumination for they in themselves are not adequate for the provision of good illumination.

In the foregoing tabulation of suggested intensities it will be noted that more light is recommended for molding and coremaking than for casting, shaking out, etc. This, of course, is because the latter operations are of a much coarser nature and do not require nearly as close visual application. However, in many foundries, all of these operations are carried on at the same place, molds, etc., being prepared and set in the morning and pouring done in the afternoon. Where this is the case, naturally an installation should be made which will provide the higher intensity, then adequate light will be had for all exacting work, and when pouring is done and the atmosphere becomes charged with smoke, dust, etc., thus cutting down the intensity of light at the working positions, a sufficient intensity will still be available to see all that is necessary clearly.

Lamps Should Be Kept Clean

More or less dirty, smoky atmosphere which pervades the foundry, offers a problem which should not be slighted. This, in reality, is two-fold, having to do first with the color of wall and ceiling areas and second with the cleanliness of lighting equipment.

Dark colors, of course, absorb light, and dark, surrounding areas seriously affect the efficiency of a lighting system, much more wattage being required to light a building to a given intensity than where these areas are light in color. Daylight is similarly affected and, further, the general appearance of a room with dark surroundings is dismal and oppressing. While that would not have been thought of years ago, today the modern foundry paints for light and with modern manufacturing methods and ventilating systems light walls and ceilings are practicable and desirable.

In the matter of maintaining lighting equipment, it may be said that failure to service lighting equipment is a serious matter. Dirt on lamps and reflectors absorbs light but does not lessen energy consumption so that the cost per unit of light is greatly increased, while the worker's ability to see is greatly reduced. In this service it usually is desirable to clean at intervals of about four weeks. With average energy rates, it can be shown that this is economically desirable as well as essential for maintaining satisfactory working lights.

As an example of the economic importance of regular maintenance, we may take the case of a typical small foundry having a lighting system consisting of twenty 500-watt lamps suitably equipped with reflectors and providing when new, an intensity of six-foot candles. Intensity measurements taken after one month's operation show a decrease of 1-foot candle or 16 2/3 per cent in the light on the work. The artificial lighting system is used on the average of 100 hours per month. The rate paid for electrical energy is 5 cents per kilowatt hour. Thus the monthly cost of energy used for lighting is

$$\frac{500 \times 20 \times 100 \times .05}{1000} = \$50$$

Assuming the equipment got no dirtier during the second month, which of course is a purely hypothetical supposition, the cost of the energy generating light wasted through absorption by dirt on the lamp and reflector would be 16 2/3 per cent of $50 or $8.33. This means that it would be economically possible to pay a man 60 cents per hour and allow him 40 minutes to clean each unit.

Lighting is one of the most important factors entering into foundry operation. Its ability to promote safety, increase production, stimulate morale, reduce spoilage and preserve health and comfort is proven and the management of every plant owes good lighting to themselves, their employees and their stockholders.

Publishes Simplified Practice Primer

Numerous inquiries sent to the division of simplified practice of the department of commerce during the past five years on its organization, reason for being, methods, procedure, and the results of its services, has led the department to publish "A Primer of Simplified Practice" which provides answers to a number of typical questions on this work. The booklet contains 58 pages explaining various phases on waste elimination and also contains a bibliography of simplification. The price of the bulletin is 15 cents.

Harry R. Taylor, Detroit, who was appointed district representative for the Shanafelt Mfg. Co., Canton, O., as mentioned in the Jan. 15 issue of THE FOUNDRY will represent this firm only in connection with its steel flasks.

How and Why in Brass Founding

By Charles Vickers

Melts Aluminum Scrap

We make small aluminum castings using scrap aluminum, but the castings come dirty and porous. What can we use to clean the metal while in the furnace?

In melting scrap aluminum the heat never should be permitted to get hotter than indicated by a dull red color. If clippings are used, compact them by pounding into cabbages and watch the melting continuously. Be in a position to add more material just as quickly as that previously added becomes molten. When the pot is filled with molten metal, heat it until it shows red, but not a bright red like copper, then drop on the surface of the melt about a tablespoonful of zinc chloride wrapped in a piece of thin paper. Allow the latter to burn away, then rabble the chloride around the surface of the metal, and when all water has boiled off, stir it into the aluminum as well as possible. This will disentangle the dross from the metal, and if the castings are poured as cool as it is possible to flow them good results will be attained.

Metal Penetrates Cores

We are using flour sand cores for brass bushings 12 inches long with unsatisfactory results as the metal filters through the core making it practically impossible to get the core out. These cores are one-inch diameter, and the thickness of metal in the bushings is about 1¼ inches. Can you recommend a mixture that will stand up for this work?

The flour sand core should be perfectly satisfactory, and will be, but its surface must be protected so the metal is unable to penetrate the core substance. Usually for a core of small diameter, an oil sand core is better than a flour sand core, simply because it is stronger, but if the wiring is such that a good flour sand core can be made, it is satisfactory.

To protect the core use either plumbago or red talc as a coating for the core. If plumbago is used, give the core a wash when it is dried and still warm, then dry, and when it comes from the oven, have a paste ready of plumbago and molasses water; some use kerosene. Rub this paste all over the core and polish the surface like a stove. This will produce a surface on the core that the metal will be unable to penetrate.

Make Brass for Switches

We are making blades for electric switches and are required to keep the conductivity as high as possible and yet get strong castings. We would like to know the relative conductivity and strength of alloys ranging from 95 per cent copper and 5 per cent tin to 99 per cent copper and 1 per cent tin.

Purity and electric conductivity in the case of copper are synonomous terms and to get copper castings with a conductivity of 90 per cent of that of pure copper, it is necessary to add such substance as boron suboxide or silicides of calcium and magnesium that after their work is done leave no residue in the copper of a metallic or other nature that will act as an impurity and lower greatly the conductivity of the red metal.

The addition of tin immediately spoils the conductivity of the copper. With an addition of 1 per cent of tin there is a comparatively small gain in strength, but a great loss of conductivity. As copper containing 1 per cent of tin will not produce sound castings, another impurity must be added the action of which is calculated to keep the gases in solution and thus get sound castings. With 1.40 per cent of tin, using either silicon or phosphorus to get sound castings the electrical conductivity of the alloy is lowered to around 42 per cent of that of pure copper. Further additions of tin, lower the conductivity still more.

To obtain strength, other metals must be added to the copper. In the case of tin additions, which are the only additions that are practical in brass foundry operations, it is neces- to add sufficient to lower the electrical conductivity to a point where this advantage is lost. The slight loss caused by higher tin is of little consequence, being compensated by increasing the section of the castings. We suggest the following alloy as being as good as any to meet such conditions; copper 90 per cent; tin 6.50 per cent; zinc 2 per cent; lead 1.5 per cent.

Alloy Resists Pressure

We are experiencing considerable trouble with aluminum castings leaking under pressure of gasoline. These castings have a section of about ¼-inch thickness, and while we have used silicon and copper as a hardener to close the grain, we do not seem to be successful and ask that you please furnish us any information which you may have regarding this subject.

Possibly the amount of copper added to the aluminum was insufficient to close the grain properly for pressure resisting purposes. Ordinary casting alloys of aluminum and copper with, or without silicon will not hold pressures. To do so it is necessary to run the copper up as high as 14 per cent in some cases. There are a number of pressure resisting aluminum alloys on the market. We suggest a test of an alloy containing around 12.5 per cent copper, with or without tin as the test determines. The maximum amount of tin to be used in this alloy is two per cent.

Acid Resisting Bronze

We would like to obtain the formula for an acid resisting bronze generally used in making sulphite digestor castings.

There are a number of different mixtures used for the purpose mentioned and they may contain from 2 to 10 per cent lead with a tin range from 5 to 10 per cent. Some add a little zinc, and others imagine zinc to be a poison and carefully exclude it. However, as a little zinc will make it easier to get sound castings free of oxides, it is advisable to add some. Thus one alloy used is copper, 80 per cent; tin, 10 per cent, and lead, 10 per cent, which will cast much better when 2 per cent zinc deducted from the copper is included. Another alloy much used is copper, 88 per cent; tin, 10 per cent, and lead 2 per cent. This also will produce a much better casting if 2 per cent of zinc, taken from the copper content, is included. The 88-10-2 lead alloy, is far from an easy one to make and get castings that are sound and dense. It can be done without the addition of any zinc, but requires the services of a metallurgist.

GOOD PATTERN EQUIPMENT
Cuts Production Costs

By K. V. Wheeler

IN MANY foundries in the past, and unfortunately, in some foundries at present, decisions governing the practices to apply to the manufacture of specific castings have been based frequently on tradition and guesswork instead of scientific study. Progressive steel foundries, have emerged from the stage characterized to undesirable extent by precedent and speculation; and by the application of definite knowledge, have been able to approach their problems with a greater assurance than they previously felt, that desired results will materialize, with increased satisfaction to consumers.

Modern foundries fully appreciate and endorse the business philosophy in the statement that "a satisfied customer is the best asset." They realize the fact that their customers' interests are their own. With respect to no detail is this more pronounced than in the consideration of pattern equipment. No other factor jointly controlled by user and producer has such a tremendous influence on the economical production of castings. Its importance is not limited by actual cost nor by selling price. It involves full appreciation of machine shop costs, losses due to rejections, expense of assembly, serviceability of the castings, and probable future demand for the machine or equipment in which the castings are used.

Although it is a well recognized fact that there are several standards of quality dependent on the use of steel castings, relative superiority in any class merits serious consideration. Tractor shoes plowing through mud and sand shortly after being put into service do not require the high surface perfection demanded in exposed castings on embossing machines used by Tiffany. Shifts and other surface imperfections on large housings are not as objectionable as are the same defects on parts applied to the exteriors of motor trucks.

But suitable pattern equipment is as important for tractor shoes and housings, as for castings that contribute to the desired symmetry of those devices that depend for their appeal partly on appearance. Patterns properly designed and constructed permit the manufacture of better castings, or cheaper castings, or castings superior both as to quality and cost, than is possible when poor patterns are supplied.

The principal considerations in determining the suitability of pattern equipment follow in order of their relative importance:

1. The quality of castings to be produced not only on initial orders, but on subsequent orders.
2. The assurance that pattern equipment will enable the foundry regularly to make the best possible deliveries consistent with the desired quality.
3. The lowest casting cost consistent with satisfactory quality.
4. The life and the maintenance expense of pattern equipment.

It is doubtful if the average buyer of steel castings is sufficiently familiar with foundry practice to understand the problems confronting the manufacturer, or the extent to which the factor of pattern equipment may influence the quality, delivery, and cost of the material. His natural queries are, "Why do you demand mounted patterns?" "Why are loose patterns not satisfactory?" "We obtained good castings from this mounted equipment in another foundry. Why is it not suitable for you?"

The answers to these questions are quite apparent to every foundry executive, and should be made equally so to the casting buyer, as these demands are not the result of mere whims on the part of the manufac-

Good Patterns Enhance Foundry Service

THE accompanying article is abstracted from a paper presented at a recent meeting of sales representatives of the Electric Steel Founders' Research Group. Such periodic conferences in which operating executives participate, are intended to inform those who merchandise the products of the associated plants regarding production and service problems of interest to consumers.

The abstract of Mr. Wheeler's paper is published by permission of the Electric Steel Founders' Research Group, the members of which are as follows: Fort Pitt Steel Casting Co., McKeesport, Pa.; Lebanon Steel Foundry, Lebanon, Pa.; Michigan Steel Casting Co., Detroit; Nugent Steel Castings Co., Chicago; and Sivyer Steel Casting Co., Milwaukee.

The author is general manager, Lebanon Steel Foundry.

FIG. 1—A TYPICAL LOOSE PATTERN. NOTICE IRREGULARITY OF DESIGN. FIG. 2—PATTERN IN MOLD SHOWING PARTING JOINT

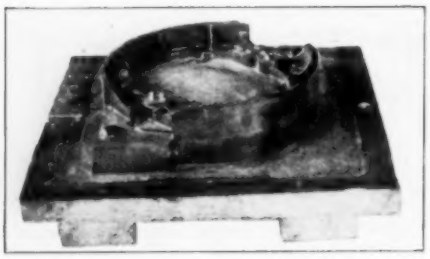


FIG. 3—SUITABLY MOUNTED PATTERN

turer, but arise from natural causes over some of which he has very little, if any, control. We will endeavor to answer these questions, dealing first with mounted patterns vs. loose patterns.

Use Of Typical Loose Pattern

Fig. 1 illustrates an ordinary loose pattern in many respects typical of loose patterns in general. Among these are its irregularity of design and the frailty of construction. The making of molds from such a pattern requires a skilled workman, whose usual procedure we will describe.

From a more or less careful study of the design the molder decides on the type of gate to use, and at what point or points it should join the pattern. He also determines the number, location, and size of the risers to take care of the steel shrinkage when the steel is solidifying. These decisions are based on his judgment or past experience.

The molder then determines from a careful scrutiny of the pattern itself, just where the parting line shall be, or in other words, to what point on the pattern it shall be imbedded in the sand, of both the drag and cope. This imaginary parting line is necessarily irregular on this pattern, and the molder must be certain that every surface of the pattern from that line to its extreme edge will draw from the sand without obstruction.

The workman must further determine the location of an imaginary horizontal plane corresponding to the joint of the flask, and must place the pattern in relation to this plane so that all surfaces on it will draw from the sand at right angles. This is imperative in the upper or cope section of the pattern, as the sand is lifted with the flask, which is guided by the flask pins at right angles to this plane. Any part of the pattern forming an acute angle with this plane will tear the sand from the mold. Although not necessary in the drag section, it is desirable to have all points of the pattern drawable at right angles to this plane.

These decisions require skill and experience, and are necessary in the making of each mold, regardless of the number made from the same pattern. A slight deviation from the correct parting line or in the position of the pattern in relation to the horizontal plane will cause the sand to break away when the cope is removed or when the pattern is drawn.

The pattern is then placed on a board, and blocked up securely under all unsupported parts, so that the compression of the sand in the drag will not distort nor break the pattern. Patterns such as illustrated are often broken due to poor judgment or carelessness in supporting them in the flask. In locating the pattern in the flask, proper allowance must be made for the gates and risers, as these require additional space beyond the line of the pattern itself. After the drag is rammed and rolled over, the joint of the mold is formed by means of special tools, as in Fig. 2. This requires skill and experience of no small degree, as every point on the parting surface must be hard, smooth, and true. If this parting has uneven surfaces or soft spots, the compressed sand in the cope will swell into it, making a ragged joint, or causing large pieces of cope sand to remain on the drag instead of coming away cleanly when the cope is removed.

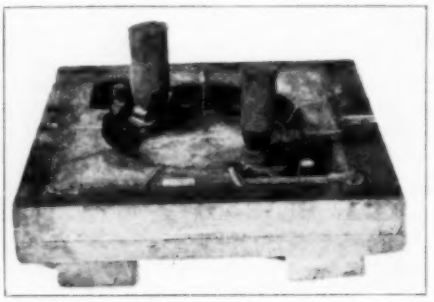


FIG. 4—PARTING LINE HAS BEEN ARRANGED

The pattern is then struck sharply with a hammer or rapping tool to loosen it from the sand. This causes rapid deterioration and is one of the main reasons why loose patterns must be replaced frequently. The drawing of the pattern is a hand operation. It requires a firm, steady, yet sensitive hand, as the line of draw is controlled almost entirely by the sense of touch. With special tools the molder then forms the pouring gate and risers.

Involves Hand Work

Nearly every operation in molding from loose patterns is hand work, and uniformity is entirely dependent on the judgment and skill of the molder. Mistaken judgment regarding risers may result in shrink holes in the casting, sometimes detected before leaving the foundry, but many times not showing up until expensive machine work has been done. Lack of discretion or care with respect to parting line causes patched molds, and castings with improper contour. Excessive pattern rapping affects casting dimensions and increases casting weight unnecessarily.

Loose patterns, especially when long and "rangy," or when poorly constructed, are apt to warp, causing dimensional errors in the casting. Loose patterns are subject to more breakage on account of their method of use, which often delays production until the pattern shop schedule permits repair work. Occasionally very small quantities are required, not warranting the expense of mounted pattern equipment, but when immediate needs or future requirements are sufficiently large, the foundry is justified in demanding mounted patterns, from which customers will derive benefits fully justifying the costs involved.

Compare the method described, with the proper use of suitably mounted patterns, as illustrated in Figs. 3 and 4. The parting line and the imaginary horizontal plane have been fixed in the pattern shop where necessary tools are available to accurately determine these locations. The pattern is secured to a board or placed so that its relative position will remain fixed.

The proper sizes and locations of pouring gate and risers have been determined through experimentation. As these are to become permanent parts of the pattern equipment, sam-

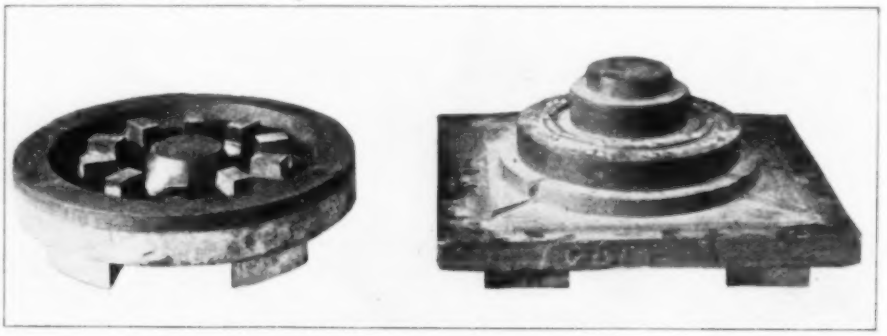


FIG. 5—PATTERN EQUIPMENT FOR HUB WHEEL CASTING

ple castings are made, checked dimensionally, and examined internally to ascertain if the gates and risers are properly located and of the right sizes to insure sound castings without wastage.

Molding Details Vary

While the details of molding operations with mounted patterns vary according to the types of machines employed, the skill required for their proper use is much less than that needed for molding loose patterns. Many important factors affecting the quality of the castings are satisfactorily provided for only by the use of mounted patterns. Vibrators substituted for hand rapping loosen the pattern from the sand without injury to pattern or mold. Following this, the pattern is withdrawn steadily and smoothly, as this operation is controlled by flask pins and is further assisted in some cases by mechanical movement. Speed of production is increased since before the work of making the mold is started, no time is lost in considering the peculiar characteristics of the pattern which govern the arrangements for gate, riser, parting line, and other important details. All of these items are satisfactorily regulated by permanent portions of mounted pattern equipment, the use of which minimizes wear and abuse, with resulting benefit to the casting.

The occasional request for mounted equipment of a kind suited to a foundry's particular practice sometimes is regarded by a consumer as an exhibition of an arbitrary attitude, if other mounted or gated patterns used successfully in another foundry were furnished. Lack of familiarity with foundry conditions on the part of many users of castings often makes advisable a clear, concise explanation.

Every foundry can produce a greater number of satisfactory castings per man-hour from one kind of pattern equipment than from another. This may be due to the special training of the organization along well defined lines, or to the use of certain types of equipment and kinds of materials.

The fact that methods vary in different foundries is no indication that one method is right and all others wrong. It would be absurd to state that one type of automobile motor is the only good design, and that all motor car manufacturers should adopt that type. Each designing engineer, working along his own lines has accomplished certain desired results, indicative of progress toward an ideal for which all are striving.

In the old days preceding our present keen competition and intensive production, foundries accepted any kind of pattern equipment which might be furnished. As cost and production were of minor consideration, judged by our present standards, satisfactory castings were produced from such equipment. These conditions have changed, and the fact that each foundry has developed and improved its methods of manufacture, necessitating various kinds of patterns, is an illustration of progress.

FIG. 7—HUB WHEEL CASTING

One foundry may have developed a very extensive use of cores, and in so doing, may have become very proficient in their manufacture and application. This condition may have been created by the character of work usually produced in that shop. Another foundry, to a relative extent, may have neglected the core room and may have concentrated effectively on molding methods to obtain corresponding results. Castings of the same design and size produced in either foundry might be of equal quality at the same cost, but to accomplish these results pattern equipment of different design and construction would be required.

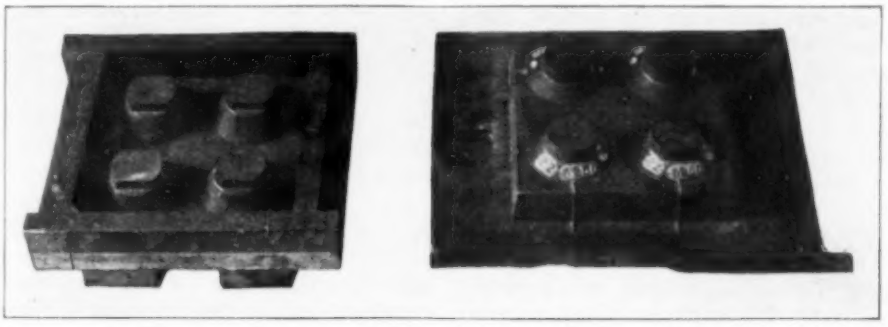


FIG. 6—MOUNTED PATTERN FOR SMALL BEVEL GEAR BLANK

FIG. 8—DIFFERENTIAL GEAR HOUSING

As another example, one foundry having skilled labor in abundance may have developed reasonably good production with the use of comparatively simple patterns. Another foundry, without available skilled labor, may have been forced to the use of expensive machines operated by unskilled labor, which, after development, enables it to produce at the same or lower costs, equally satisfactory castings.

A third example might be that of a foundry that has highly developed the use of any one or more of the many types of molding machines, such as straight squeeze, straight jolt, jolt squeeze, jolt roll-over, jolt roll-over draw, roll-over draw, squeeze roll-over draw, jolt stripper, and others. Proficiency is acquired by the continued use of any one of these types, but the pattern equipment best suited to each may differ greatly.

Equipment May Vary

It should be apparent to any student of this problem that the foundry is justified in demanding the type of pattern equipment to which its men are accustomed, which will permit applications to its machines, and which will render the greatest production per man-hour. Additional examples of these differences in foundry practice requiring special pattern equipment could be given, but the above should be sufficient to illustrate the fact that many differences exist, and these differences are due to logical causes.

One foundry because of regular practice and local conditions may be able to produce the best castings of certain designs by the use of dry sand molding. The shop may not have made sufficient improvement in its facing sands to produce such cast-

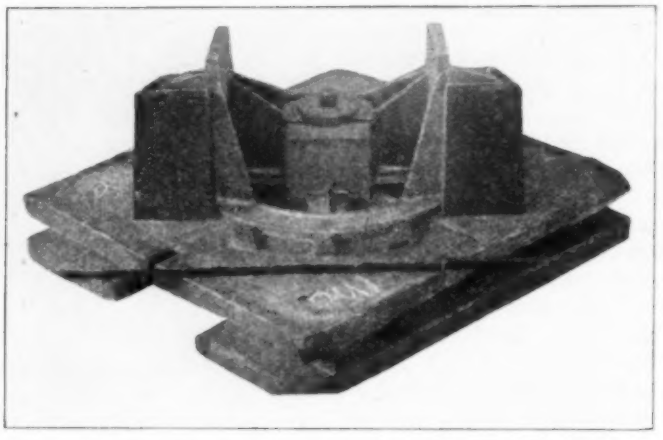


FIG. 9—ROAD SCRAPER BOLSTER CASTING WITH DEEP RIBS AND THIN HIGH RIBS

ings satisfactorily in green sand molds. Another foundry, whose general character of work would not necessitate the use of mold drying ovens may have been confronted from time to time with certain castings quite difficult to produce in green sand, and consequently may have developed a superior facing sand, which, in connection with cover cores or other special features has produced equally satisfactory castings. The kinds of pattern equipment suited for these two methods are necessarily different.

Pattern Requirements Differ

Some foundries specialize to a great extent in the making of very thin sectioned, intricate work, which requires metal of extremely high temperature. This hot metal may increase the amount of shrinkage for which provision is made, in certain designs of castings. It may be necessary to use a different shrinkage allowance in making the pattern. In some cases castings must be poured in positions differing from those ordinarily observed in foundries using relatively colder metal. In such circumstances, patterns suitable for the one foundry may not be suitable for the other.

It is not the purpose of this paper to advocate any particular method of foundry practice. But to more clearly illustrate some of the points mentioned above, we will give several examples, showing how we have been able either to effect a material saving in production cost or to produce a more satisfactory casting.

Figs. 5 and 7 illustrate pattern equipment and a wheel hub casting used by a motor truck manufacturer. The pattern equipment when received consisted of cope and drag board, for making the entire casting in green sand, excepting the core for the center.

Anticipating shrinkage trouble in the several flange bosses, we concluded risers were necessary over each boss. To simplify molding and to insure proper pouring so that hot metal would enter each riser, making it effective, we made cover core equipment as illustrated. The results were satisfactory and the castings were machined without showing flaws. Incidentally, we have learned that another foundry, using the original equipment, had twice filled orders for castings, practically all of which had been rejected on account of shrinkage in the flange bosses; and that these flaws had not been detected until expensive machine work had been done.

Fig. 6 illustrates the pattern mounting for a small bevel gear blank. The original equipment furnished consisted of one loose pattern which was used on the initial order, resulting in a very high molding cost. The cleaning expense was excessive, as the castings were gated on the beveled surface, which required very careful grinding to contour. On a squeezer machine the mounted pattern equipment illustrated produces four castings per mold, and the cleaning operation is simplified, as the gate enters the riser, which necessitates grinding only on the flat surface of the hub.

Fig. 10 shows a well mounted pattern for a box-shaped motor truck bracket. The original design necessitated a dry sand internal core. It was almost impossible to produce satisfactory castings on account of shrinkage cracks, and the castings so made carried a very high cleaning cost and were never entirely satisfactory.

These difficulties were discussed with our customer, who permitted us to remove the lower web and to increase proportionately the side walls, thereby maintaining the desired calculated strength. Following this change, the interior was made in the green sand of the mold, eliminating cracks, and reducing the time and expense of finishing. The general appearance of the castings was superior to that of the castings furnished from the original pattern, and as no shrinkage difficulties developed, the strength of the castings was materially increased.

The influence of these changes on delivery was marked. From experience, every foundryman knows the effect on delivery of a high-cost, slow moving, cleaning room job. It is the writer's opinion that this has been one of the greatest factors in broken promises. When changes in pattern equipment or design speed up the finishing process, customers can be assured of better deliveries than were previously made.

Fig. 8 illustrates a differential housing. The pattern as received necessitated the use of a dry sand core which caused many shrinkage cracks. To expedite a required quick delivery, the pattern was used as received on the initial order, and a high percentage of the castings was rejected after machining work. We requested entirely new equipment, which on this type of job is quite expensive. The castings subsequently produced with the new equipment were entirely satisfactory, and not one of the many shipped has been rejected.

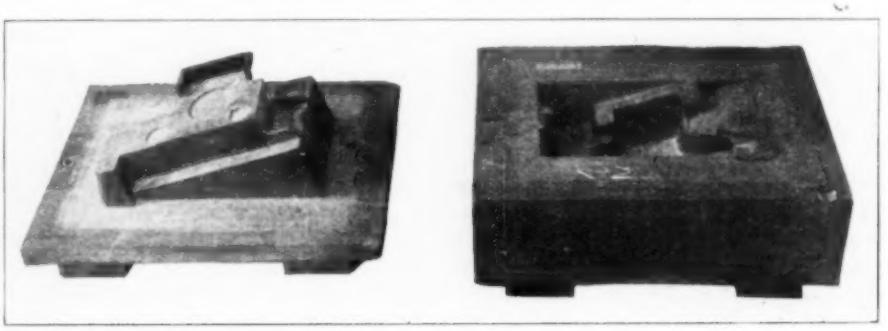


FIG. 10—WELL MOUNTED PATTERN FOR MOTOR TRUCK BRACKET WHICH ELIMINATED INTERNAL CORE

Fig. 9 illustrates a road scraper bolster casting, having deep pockets and thin high ribs. The original pattern furnished was of wooden construction, and as the ramming of the sand had a tendency to distort or break

the ribs, it was difficult to draw the pattern without tearing the sand. The castings produced from such molds were far from true, and the excess metal was sometimes prohibitive. Repair work was necessary very frequently, which always delays production. We requested metal equipment which has now been in service several years, resulting in the elimination of repair work and delays, and in the production of castings uniformly satisfactory.

Numerous instances of similar character could be enumerated where the change to suitable pattern equipment has effected economies in production or improvements in quality. What we have given should be sufficient to justify the foundry's demand for suitable patterns. The customer's cooperation is essential, as this is the one point of contact where his actions will influence the production cost. Other factors controlling production cost or quality are quite beyond the purchaser's jurisdiction. Our metal, facing, binders, fuel, etc., are our own problems, but on the subject of pattern equipment we require his cooperation.

Pattern Costs Included

The true cost of producing castings in any foundry is the entire cost incident to their manufacture, and includes the expense of all pattern work. Some foundries may elect to absorb certain pattern charges, but when they do, these charges are probably included in the selling price. Castings produced from unsatisfactory equipment result in higher costs, again reflected in the selling price. We are pointing out these self-evident facts to show that the consumer pays for his pattern equipment, whether he gets it or not.

Many foundries include this pattern expense in their general operating costs, thereby inequitably spreading it over their entire output. This places an unwarranted burden on the customer furnishing satisfactory patterns, as he is helping to pay for another man's shortcomings. The more progressive foundries are placing this burden on the pattern which necessitates extra expense. It is hoped that all foundries will soon adopt equitable methods of cost distribution, for good business sense demands that each casting bear the entire burden of cost incident to its manufacture.

We cannot hope to swing to this principle overnight, the entire line of casting users. This will be accomplished only through the work of our intelligent sales representatives in presenting the facts in a convincing manner every time the question of pattern equipment arises. By their persistent efforts, we will gradually convince the buyer that it is for his interests as much as ours to give us the proper tools with which to work.

Railroad Rate Hearings To Begin in March

General dissatisfaction with the iron and steel rate in the official classification territory—broadly, north of the Potomac and Ohio rivers and east of the Mississippi—has resulted in the filing of numerous complaints with the interstate commerce commission. Following a preliminary conference in New York on Dec. 4, the commission decided to merge all pending complaints and to open the door to all interested parties without the procedure of filing a formal complaint. This promises to develop into the most exhaustive investigation into railroad freight rates on manufactured iron and steel articles in carload lots. The series of hearings will be held before Commissioner Campbell and Examiners Faul and Bardwell.

The initial hearing will begin at the chamber of commerce, Pittsburgh, March 16. Then will follow hearings at Columbus, O., April 19 in the United States courtrooms; at Detroit, April 25 at Hotel Statler and at the Great Northern hotel at Chicago, May 12. If additional hearings are necessary, they will be scheduled.

Chairmen of the various shippers' committees are as follows: New England, R. W. Poteet, Stanley Works, New Britain, Conn., Trunk Line, H. C. Crawford, Bethlehem Steel Co., Bethlehem, Pa., Central Freight association, A. H. Brown, chamber of commerce, Cleveland; and Illinois-Indiana, Murray N. Billings, Illinois Steel Co., Chicago. Commodities coming within the scope of the hearing embrace practically all manufactured iron and steel products including such foundry products as bearings, chain or link belting, annealing and charging boxes, brake shoe parts, chain, fittings, links, plates, underframes, wheels and weights, and miscellaneous castings.

To Manufacture Alloy

Arrangements have been completed whereby the American Brass Co., New York, will take over the manufacture and sale of a patented nonferrous alloy composed of copper, silicon and manganese which was developed by the Du Pont Everdur Co., Wilmington, Del. The American Brass Co., will manufacture this alloy in casting ingot form and also in special shapes.

Test Steel Strength

The engineering experiment station of the University of Illinois in co-operation with the American Steel Foundries, Chicago, recently carried out a number of tests on the fatigue strength of cast steel. Two steels were used, one a special manganese steel with a manganese content of 1.71 per cent, and the other a representative carbon steel with 0.25 per cent carbon.

Various heat treatments that did not involve water or oil quenching were given to the samples which then were tested. As cast, the steels tested showed a coarse grained crystalline structure; the manganese steel showed a marked dendritic structure.

By suitable heat treatment it was possible to give a finer grained structure to the cast steel. The result of such heat treatment was to increase to a marked degree the static tensile strength, the ductility, the brinell number, the Charpy value, the repeated impact value, and the fatigue strength (endurance limit) of the cast steels.

For the cast steels tested the ratio of endurence limit to ultimate tensile strength (the endurance ratio) averages 0.42, which is slightly less than the average value for ordinary rolled steel. Results of tests indicate that under favorable casting conditions and by the use of suitable heat treatment cast steel can be produced having a strength under either static load or repeated load, only slightly less than the strength of rolled steel of similar chemical composition.

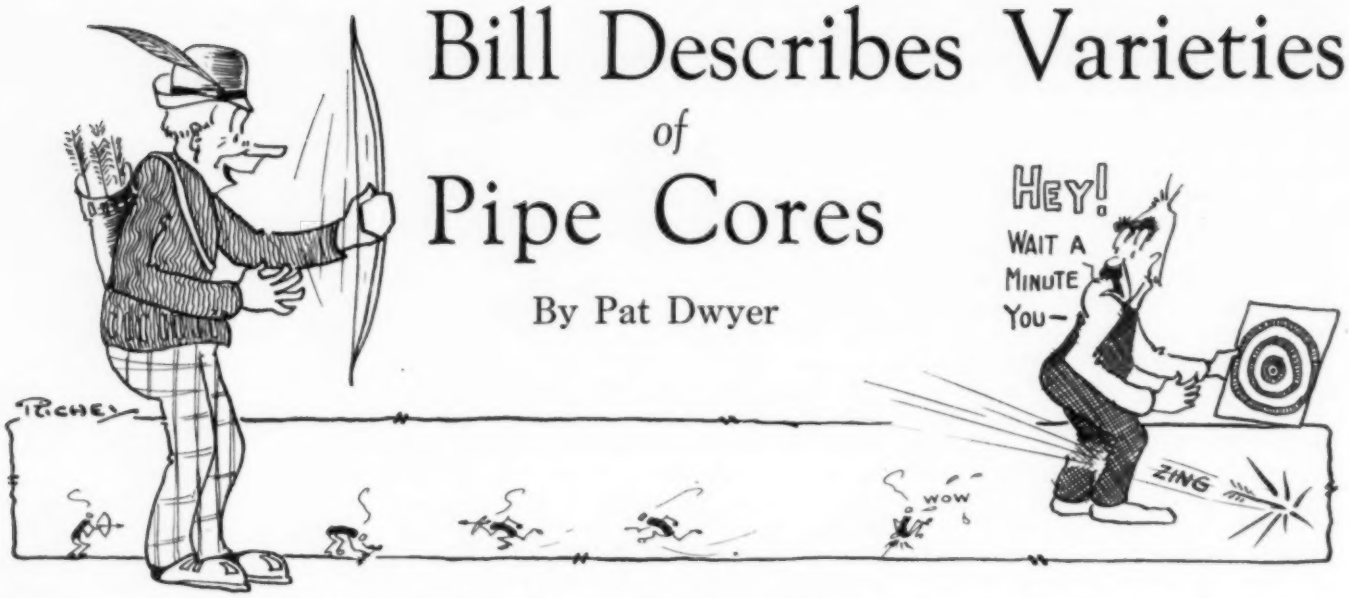
Details of the analyses, heat treatments and tests may be found in bulletin No. 156 published by the engineering experiment station, University of Illinois, Urbana, Ill. The price of the bulletin is 10 cents.

Publishes Catalog on Track Equipment

Mine and industrial track equipment and other products are described in a booklet recently published by the Bethlehem Steel Co., Bethlehem, Pa. The catalog contains such information as is necessary in ordering the products, as well as other data, tables and calculations which will be of interest to the users of light rail equipment. The products listed include frogs, switches, switch stands, guard rails, crossings, steel ties, light rails, and miscellaneous steel products. The catalog is well illustrated and contains 159 pages.

Bill Describes Varieties of Pipe Cores

By Pat Dwyer



LIFE, as some old jolly dead and gone philosopher remarked on one occasion, is made up of disappointments and disillusionments. Speaking in similitudes as becomes one discussing a deep philosophical subject, the dear old boy landed the shaft plumb in the center of the bull's eye. It is doubtful if the ancient one could draw an actual yew bow string back to his ear, even if he favored the operation by bending the aforesaid ear forward to the extreme elastic limit. Figuratively, he was right there with the goods. He dropped the aphorism in the center of the mental target as neatly and accurately as ever Robin Hood in his suit of Lincoln green sent the goose feathered shafts whistling to their mark in the brave days of old.

At this point the temptation is strong to ditch the earnest lesson I had in mind when I filled my pipe and sat down to develop the old philosopher's theme to the extent of a few thousand words. It is far easier and much more pleasant to throw the mind back a few centuries and join Robin's band of free companions in their care free and happy life under the greenwood tree. Can you imagine a sweeter form of existence? Hunt the king's deer and play all day. Bask in the sun and bathe in the sweet purling brooks. Up and away full of lusty strength at the break of day, seeking such adventure as a beneficent Providence might see fit to provide. Return at night to congregate around the ruddy camp fire at which the haunches of venison slowly were assuming an unctuous and delectable appearance. Joining in the rollicking chorus led by jolly Friar Tuck and punctuating every verse with a pull of nut brown ale, served up in leathern jacks. Then at peace with all the world, with a full stomach and a clear conscience, to stretch the weary limbs on a soft and aromatic couch of fern and dream the happy hours away until the rising sun announced the beginning of a new day.

Ah me! The delightful life of Sherwood forest exerts a heartening pull at the primeval emotions, but duty is duty and we must e'en drag ourselves away and once more set our well worn beak on the cruel grindstone of this workaday world. Considering the length of time the average citizen is held up against it, one marvels at the fortitude displayed.

Returning therefore to the philosopher's reflection on disappointments, and all that kind of thing, my own experience is a case in point. In my younger days and for many years thereafter when I had to report for duty at 7 a.m. I experienced the greatest difficulty in creeping out of bed in the morning. In the words of Walt Mason I cheerfully would have given a million dollars if I had them, to sleep a thousand years. Now, when I do not have to put on the overalls until much later and, therefore, am in a position to spend an extra hour or two in bed, I awake before 6 a. m. and have not the slightest desire to lie in bed any longer. When I needed sleep I could not get it and now when I can get it I do not need it. Try to figure that out on your slide rule, Archie!

Inquisitive people, who like to work out puzzles and who take pleasure in reasoning from cause to effect, probably will claim that if I had gone to bed in the early days at a reasonable hour as I do now, sometimes, I could have jumped out of bed like a jack-in-a-box with the first streak of dawn. I don't know. Such a preposterous idea never entered my head. The days and nights were altogether too short to take care of my many activities. I disliked the idea of going to bed almost as strongly as I hated to get up. The only occasions on which I can remember dressing cheerfully in the morning were those on which I arrived home in time to shed the festive garments, delicately scented with lily of the valley and don those which exhaled a mingled aroma of damp sand, sweat and core smoke. This was not such a trying ordeal in summer, but believe me it required heroism of the highest order to creep inside a frozen shirt in the dark, early hours of

ONE OF THE ORIGINAL DRAWINGS FROM *EXCELSIOR*

the morning with the thermometer hovering around zero. A warm breakfast dispersed some of the chill, but the reinforcement was not proof against the bitter wind I had to face in the mile walk that lay between me and the shop.

Wild blasts of winter sweeping down from the eternal frozen wastes of Labrador, nay, from the very pole itself, whipped around me and penetrated through every protective coating while I floundered through snow drifts that threatened to bury me at every step.

When I finally arrived at the shop, chilled to the marrow, with numbed fingers and toes and with my eyelids frozen together I was faced with the cheerful prospect of starting a fire in the salamanders. The orthodox method was to dart across the yard and borrow a shovelful of live coals from the old crab who attended the boiler. He sat there comfortably in front of the fire door and showered down maledictions on the heads of all kids who came in to disturb his fire. He appealed to high heaven to know how he was going to keep up steam with every blighted young cub in the country coming in and dragging away his fire by the shovelful.

By a superhuman effort of self control the young gentlemen refrained from the retort courteous until they were safely outside the door. Then they usually consoled him with the reflection that eventually he would have all the fire he needed in a place where *they* would not disturb him. Occasionally in a burst of generosity they intimated that if he went immediately his departure would be greeted by three rousing cheers. Youth is inclined to be enthusiastic.

I suppose if I were to meet him tomorrow, an entirely improbable contingency in view of his years, I should grasp him by the hand and tell him he was a jolly old scout. However, such is the power of early impressions, I would keep the fingers on the other hand crossed. I would see to it prudently that all the exits were open and I would make reasonably sure that he was not standing too close to a slice bar or a shovel.

The real agony commenced after the fires were started and the shop began to fill with smoke, acrid, choking smoke, from green wood and wet coke.

Usually a sufficient supply of old soldiers could be salvaged from the heaps to start the fires. When the supply failed on account of the soldiers being frozen in the sand my frozen conscience offered no protest when I raided the rack where the new soldiers were stored in orderly arrangement according to their length. Also many a time later in the day a molder would be moved to wonder what had happened to one of his bottom boards or the bars in his cope. Did I come out boldly like little George Washington and tell him? I did not consider that answering conundrums was included in the scope of my duties.

If pressed too closely I hazarded

FROM THE OLD SONG "FIREMAN SAVE ME CHE-ILD"

the illuminating guess that probably the rats had eaten them. Foundry rats have quite an omnivorous reputation. So far as I know they never have been accused of eating castings, but it is a notorious fact that the gangway count does not always tally with the count taken up on the preceding day. This point is referred respectfully to the statistical sharks who cannot understand why the yield of castings, scrap, gates and sprues does not equal the amount of metal charged in the furnace.

Occasionally a few buckets of warm water were sufficient to convert the sand into workable shape. On special occasions and usually on Monday morning we had to pry the lumps of sand loose with a pick and pile them up around a salamander until they thawed.

Temporary relief was afforded by warming the rammers now and again over the fire. Mittens might be donned during some of the operations, but the bare fingers had to be used to tuck the icy sand under the bars. The usual enthusiasm was lacking and the soft streaks under the bars had to be patched after the copes were lifted. Charts were unknown at that time, but if one had been kept on chipping costs it would have shown a decided upward trend in winter on account of the extra crop of wens, warts, bunions and barnacles caused by soft spots in the cope surfaces.

Bill came in the other night and by a curious coincidence he brought up the same subject. The night was particularly cold and as he dragged a chair close to the fire he remarked that it reminded him of his young days in the foundry when he invented all kind of excuses to get close to the fire. The gaffer displayed the most extraordinary ingenuity in appearing on the scene about the same time.

"Get back on your floor and stay there," he told Bill one time. "It takes me half my time watching you."

"You got nothing on me," says brave Bill, "It takes me all my time watching you!"

"Like any other business," said Bill, "The foundry presents many aggravating features, but no person can say it lacks variety particularly in the field occupied by the jobbing foundry. This point was illustrated the other day by an inquiry I had from a man who wanted to know the best method for making 8-inch pipe in 6-foot lengths. He said he understood there was a process by which the cores were made by first winding a mandrel with straw rope and he wanted to know what I thought about it.

"I told him that the cores to which he referred were known in the foundry as loam cores and were made by daubing a thickness of wet loam or mud over a hay or straw covered iron or steel tube known locally in the foundry as a barrel or arbor. This style of core has many advantages, but whether it is best from a daily cost point depends on several attendant factors. For example, loam cores are used exclusively in all the pipe shops where the castings are poured in a vertical position and where duplicate castings are made in large numbers. The original cost of the arbors rapidly is absorbed. Manifestly a different set of conditions obtain where the castings are poured horizontally and where they only are made in small numbers.

"Another feature which must be taken into consideration is that a loam core cannot be made from any kind of sand. Unless a suitable grade already is in use in the foundry it is an open question whether economy would be served by ordering a special supply for making the cores. An artificial loam may be compounded from various mixtures of fine sand, claywash and sharp sand and sawdust, but here again the question of cost enters, since mechanical mixing

equipment always must be provided.

"However, assuming that conditions warrant the use of loam cores the following brief description outlines the equipment, methods and materials. For simplicity the description will be confined to one unit, rather than to pipes in quantity. A 5-inch outside diameter barrel is required for an 8-inch inside diameter casting. This will allow for a single thickness of ¾-inch hay rope and a ¾-inch thickness of loam. A smaller barrel may be used by increasing the layers of rope and in an emergency a 5½ or even a 6-inch barrel may be employed by reducing the thickness of loam and rope to ½-inch each. However, this is a risky expedient and only to be attempted by a highly skilled coremaker provided with the highest grade of loam. Either a length of heavy steel tube or a cast iron pipe may be employed as an arbor on which to build the core. One is just as serviceable as the other and a choice will depend on the relative cost. With patterns and coreboxes available on the premises, that is patterns originally provided for some other purpose, a cast-iron arbor can be made in the foundry at a comparatively low cost with the vent holes cored in. In a steel pipe these vent holes must be drilled. Prices vary from time to time, but one of these arbors made from new steel pipe will cost approximately $1 per foot. Where second hand pipe is available of course the cost may be much less.

"A second advantage of the steel pipe and this is an important advantage where a great many cores are handled in a day, is that the barrels may be handled by hand in the core room and at a pinch the cores may be handled by hand after they are made.

"The ends of the flask are cut to fit the core closely and thus prevent any crush in the sand coreprint at each end of the mold. If the flasks are made purposely for the job a projection may be either cast or bolted on the inside of the end to rest on the coreprint. These will hold the core securely in place without further chaplet if a cast iron arbor is employed. A steel arbor will bend a little and a chaplet will have to be placed over the center of the core on the cope side if an absolutely uniform casting is required.

"In making the core, the barrel is mounted in suitable bearings at each end where it may be revolved freely. The end of a hay rope is anchored in one of the vent holes near the end of the barrel and while one man or boy turns the barrel, the second man keeps a tension on the rope and pays it out until the barrel is covered with a complete and closely wound spiral. The second end of the rope then is anchored to the barrel and the coremaker rubs a preliminary daubing of loam over the rope. He then sets the strike horizontally on two horses and located at the proper distance from the barrel to outline the full size of the core. The coremaker covers the full length of the barrel for one quarter of the diameter with thick loam. Then the barrel is revolved a quarter turn and the process is repeated until the entire barrel is covered. By manipulating the loam with the fingers and slowly revolving the mass past the strike, the core easily is brought to the proper size and shape.

"Upon its removal from the oven the core is placed back on the bearings, the strike is adjusted accurately. On long running jobs the strike is attached permanently to the horses which support the core. A coating of thin loam known as slurry is spread over the surface of the revolving core and the result is a perfectly smooth surface. Usually the core may be blackwashed at this stage, but whether it is blackwashed or not it is placed back in the oven for a second and final drying. Upon its removal the second time it is hot enough to dry a coat of blacking without a return to the oven. The barrel is turned by inserting a tapered plug attached to a crank handle in one end of the pipe. Friction holds the plug in place and it is easily removed after it has served its purpose.

"From the inquiry I assumed he was using dry sand cores, made in halves and pasted. Outside the waste of core sand involved, the cores made in this manner never are true to shape. A green-sand top on the core will cut the coremaking cost to considerable extent. The half core is dried in the usual manner and then placed joint side down on a green sand half core rammed in the same corebox. They are clamped together and rolled over. Then the composite core is lowered into the mold. A suitable block or plug is placed in the center to support the chaplet and another block is placed at each end on the dry sand part to archor the core under the ends of the cope.

"If the size of the order or future prospects justify the use of special equipment in flasks and arbors, the best method to adopt is that employed by the manufacturers of soil pipe. A thickness of green sand is swept on a cast-iron barrel. The initial expense of the equipment is high compared to that required for making an occasional casting, but the economies effected after it is placed in use are so marked that in a short time the expense is absorbed.

"Soil pipe rigging has been described several times in the columns of THE FOUNDRY. Briefly it may be covered by the statement that cast-iron flasks and cast-iron arbors are employed. Copes and drags are barred and no bottom plates are needed. The arbors are pierced with vent holes, usually rectangular slots. The number of slots required depends on the character of the sand. The ends of the arbor are turned true in the lathe and the semicircular gaps in the ends of the flask are machined to fit the arbor ends closely.

"Instructions are important," I said, "But remember, dear lad, they are not of much use without sincere co-operation. Let me tell you the parable about the fresh young salesman starting on his initial trip. 'Good luck to you' said the sales manager, 'wire us important news.'

"The following message was received next day: 'Reached here safely, good room with bath, feeling fine.' The sales manager rose to the occasion gallantly. 'So glad,' he wired, 'Love and kisses, GOOD BYE and I don't mean maybe.'"

A TELEGRAM TO THE COMPANY

Sends the Good word to the Chief

Describes Oven for Crucibles

Instances Are Presented to Show How with a Proper Annealing Oven, Life of Crucibles Has Been Increased from 25 to 50 Per Cent

By Charles F. Hopkins

DUE to war conditions, the yearly crucible expense of the Ajax Metal Co., Philadelphia which in 1914 was about $25,000—had mounted to $120,000 in 1918. The average number of heats per crucible had dropped from 30 to 14 and advancing prices made up the remainder of the expense. We had at the time a good annealing oven, but a close study showed that it might be improved. A plan was decided upon and a new oven rushed to completion, with the result that within three months the average life of the crucibles went from 14 to 21 heats, thus effecting a gross annual saving of $39,000. The oven cost about $3500, and the fuel bill the first year was $1200, making a net saving of a little over $35,000. We have continued to operate the oven with gratifying results, the average heats per crucible now being 55. We do not claim that this great increase in crucible life is due entirely to the oven. The quality of the crucibles today is much better than before the war, but we are satisfied that the use of the oven adds 25 per cent to the number of heats obtained.

In another instance a company which had purchased some of our furnaces and after their installation had continued to buy crucibles from us, complained that the crucibles were so poor the plant was unable to maintain production. We wrote inquiring about the oven and learned it was all right but that the crucibles scalped, cracked and leaked to such an extent that their average life was only six heats.

We suggested the return for examination of some of the crucibles which had failed and also some new ones that we might test them out in our plant. The old crucibles were about as bad a looking lot as I ever saw, but an examination of the 23 new ones returned for test, showed that 15 of them were prewar stock—the real Ceylon graphite and German clay kind.

We put them through our oven, giving them special attention and thereafter used them in our regular way, with the result that the average number of heats obtained per crucible was 36, the old stock having an average of 39.7 and the war stock 29 heats per crucible. As a result of this test we determined to investigate the trouble at the source.

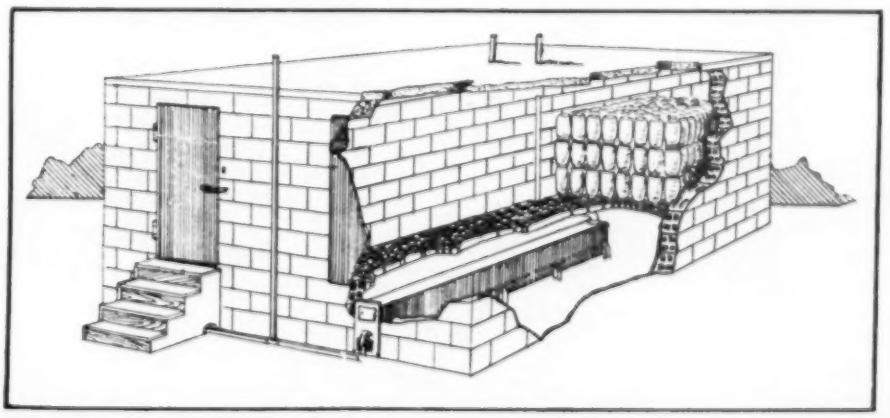
The foundry was located in a region where fuel was cheap, and as steam always was carried a room constructed of wood was steamheated. The wood had shrunk and the steam pipes were leaking live steam, while the temperature of the room was only 180 degrees Fahr. The crucibles were nicely arranged on open racks so that the moist, warm air had all the chance in the world to get in its work. These facts were pointed out and our oven described. A man was sent to examine it, we supplied a print, an oven was put up similar to ours and the trouble ceased.

In some foundries it is the practice to stack the crucibles on the top of core-ovens, furnace flues, or other warm places, while in others they are stored any old place. I have seen them stacked in part of the coke shed, the first layer standing on the dirt floor. A common practice is to set new crucibles which are to be used the next day, on top of the furnaces after the heats for the day have been pulled. This procedure is all wrong. Whenever I see this done to a No. 70 crucible I can visualize a hard earned $2 bill going up the stack. But even if the storing, drying and annealing is done correctly, the story is only partly told, because the life of any crucible is determined more by the number of hours it is in use, than by the number of heats run.

The storage or annealing oven, when put to practical use means an absolute saving both mentally and financially and the initial cost is too small for any foundry to be without one. The accompanying illustration will give an idea in construction that can be adapted by either the cask lot or car lot buyer. An oven built with two compartments permits the use of thoroughly annealed crucibles from one side while the crucibles on the other side are being seasoned and annealed. Crucibles should be stored on a rack top side down. If stored on the floor, the bottom row should be placed on strips, to permit a free circulation of air inside the crucible as well as outside.

Length of each compartment should be about twice the width for convenient handling and minimum heat loss. The walls may be hollow tile, plastered with heat resisting material on each side. The doors and roof should be insulated with about 3 inches of air cell asbestos. Heat is supplied from one gas fired radiator in each compartment located below the floor grating. The indirect radiator gives a dry heat and also insures against the burner being blown out in case the doors slam shut. A ventilating flue with a damper should be provided to carry off the slight moisture from the crucibles.

To heat a double oven, each compartment approximately 8½ feet high 9 feet wide x 18 feet long large enough to hold a carload of crucibles requires a total gas consumption of about 300 cubic feet of city gas per hour, or about 1 cubic foot of gas per hour for each 10 feet of oven capacity. Smaller ovens require proportionately less gas consumption.



ANNEALING OVEN WITH TWO ADJOINING COMPARTMENTS BUILT OF HOLLOW TILE HEATED FROM UNDERNEATH BY INDIRECT RADIATION

Lathe First Used by Ancient Race

By Walter C. Ewalt

CIVILIZATION has progressed because man has speculated and dreamed of better things. Early in the history of the human race primitive hand tools were developed, which were followed by the hand and foot machine tool and later by the power driven machine. We wonder how these first tools were thought of and invented. By what process did the minds of the ancients solve these problems? Were the machines the result of accident, or observing like things in nature, of studious reflection or a combination of the three? We know from discoveries from the stone age and the bronze age that the development of tools has been gradual and has covered many years.

Primitive mankind should be considered first, in tracing the cause for the development. He hunted his food, used the skins for clothing and found shelter in caves. Thus it may be seen that he had to depend solely upon himself to keep his family alive. During this period he invented numerous hand tools and also made a few crude hand machine tools such as the bow drill.

The second epoch came when man settled in one place and became domesticated. Previous to that time, a great advance had been made in machine tools and it was discovered that if one family produced more cloth from the spinning wheel and loom than was needed for the members of the family, they traded for the surplus grain from another family. From that condition it was only a short step to the point where one family did all of the spinning and weaving, another raised the grain, another ground the grain, another made the shoes, etc., each trading the surplus with the others.

After a time the family raising the grain saw that the family making the cloth were prospering and the job of making cloth appeared far easier than raising grain, so they decided to go in the cloth business. Here was the first competition in business. It cannot be imagined that the first family making cloth thought it was the *Life of Trade*. However, it stimulated them to improve their cloth, change their methods, speed up their production and improve their machines.

The third period witnessed the development of modern production. Several reasons may be given for the stupendous advance made by civilization in the past 100 years. However, it seems that the cause of this greatest advance primarily was the perfecting of machine tools. In fact, it is said that the past 100 years has produced more marvelous inventions of a mechanical nature than all of the previous years since the dawn of history. The chief agent of this great rise in the mechanical world was the steam engine. This gave man unlimited power to run machine tools and production was increased prodigiously.

The lathe perhaps is the best known of all machine tools. It is a machine in which an object is held and revolved while being shaped by a cutting tool. The history of the lathe is interesting. The idea of turn-

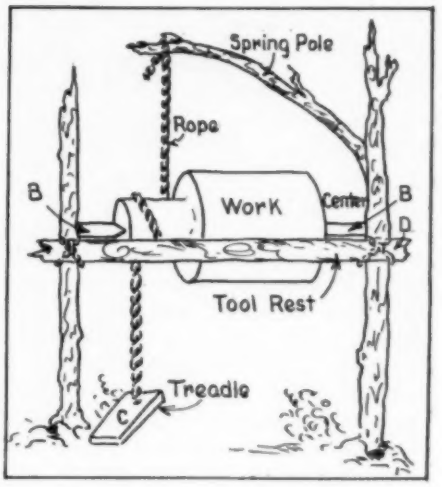


Fig 2—Crude Lathe Used By an Old Asiatic Nation

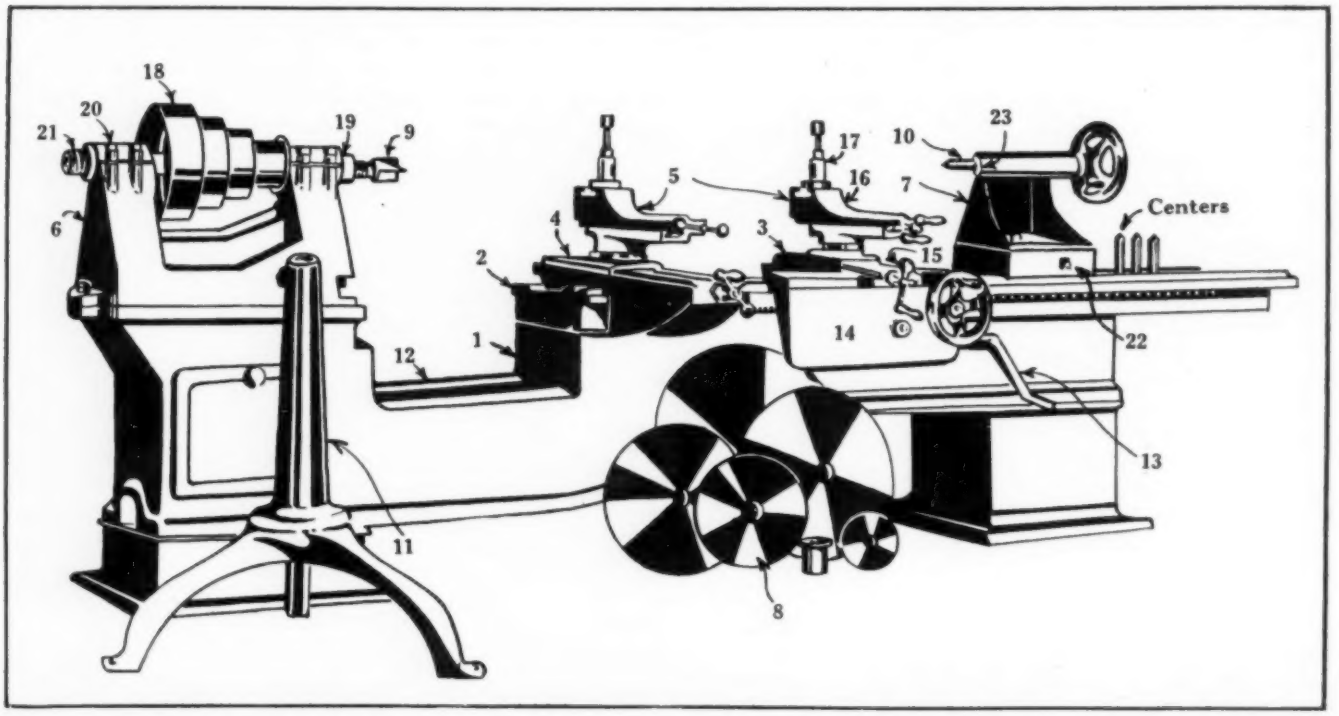


FIG. 1—THE FIGURES INDICATE THE VARIOUS PARTS OF THE GAP LATHE WHICH IS USED IN THE PATTERN SHOP

ing is thought to have originated with the potter's wheel which was a disk fastened on a horizontal plane to a vertical shaft and rotated. A potter's wheel is depicted on some of the oldest Egyptian monuments in which the god Ptah is represented as molding a man upon the wheel.

Records do not show that the turning lathe, in which the object is held between the horizontal centers, was known in ancient Egypt. However, it may be safe to say that if savage people today use a form of lathe, the tool was used before the time of the Ramses. Such a lathe now is used by the Kabyles in Africa, in turning such articles as wooden bowls.

Like most of the primitive machine tools, the action of the bowl in this lathe is forward and back or reciprocating. The centers are fastened to two uprights. The spindle is located between the uprights and the bowl is fastened to the spindle. One end of a cord is fastened to a spring pole and then looped around the spindle while the other end is fastened to a rigid upright beyond. The man presses the cord with his foot which causes the bowl to revolve toward him. While the bowl is in motion in that direction he applies the turning tool to the bowl. He then lifts his foot from the loop of the rope. The elasticity of the pole causes it to spring to an upright position and thus rotates the spindle and bowl in the opposite position. He again presses on the rope making another cut, etc.

The native of East India uses a lathe which consists of spikes, which are used as centers and are driven in two upright posts. The spindle and work is rotated reciprocally by a bow held in the left hand. The string of the bow is passed around the spindle in one turn.

This evidence makes it appear that the lathe has been used for a great number of years. Early Greek writers mention the lathe some centuries before our era. The invention was credited to Talus, the grandson of Daedalus, by the writer Diodorus Siculus about 1240 B. C. Pliny gives the credit to Theodorus of Samos. Thus it may be seen that the accounts are legendary and obscure. It is possible that all the early lathes were of the spring pole type such as used by the Kabyles and were all used to turn wood.

At an exhibition given at Vienna, *Engineering*, London, gave the following account:

"At the Vienna exhibition, there was exhibited wood, glasses, bottles, vases, etc., made by the Hucules, the remnant of an old Asiatic nation which settled at the time of the general migration of nations in the remotest parts of Galicia, in the dense forests of the Carpathian mountains. The lathe they are using has been employed by them from time immemorial. They make the cones *B*, Fig. 2, of maple. These serve as centers, one being fixed and the other movable longitudinally. The work is roughed out with a hatchet, making one end cylindrical to receive the rope for giving rotary motion. The cross bar *D* is fastened to the trees so as to form a rest for the cutting tool, which consists of a chisel. The treadle is shown at *C*. In place of the sapling a pole or lath was employed and it is thought from the word lath that the term lathe was derived."

A great improvement was made in the lathe when one center, which we call the live center, was made movable, that is rotating. The power then was applied and the work was fastened or chucked to that center. The writer recently was discussing lathes with a man who came from Germany about 40 years ago. His father had a lathe on the principle of a grindstone and this man, when a lad, had to turn the crank while his father did the cutting.

Modern lathes in a wood patternshop all are driven through belts or individual motors. The distinctive names applied to lathes are as follows: Speed lathe, face plate lathe, patternmakers lathe and gap lathe. All of the lathes differ slightly in design for the purpose of greater utility. Fundamentally they are alike because the operation performed is turning which is accomplished by cutting and shaping an object fastened between the centers.

The names by which the different parts of a lathe are known are shown in Fig. 1 as follows: 1 main bed, 2 sliding bed, 3 main carriage, 4 auxiliary carriage, 5 compound swivel rest, 6 head stock, 7 tail stock, 8 face plates, 9 spur center, 10 cup center, 11 rest holder, 12 the gap, 13 the crank for sliding bed, the rack and pinion not shown, 14 the apron, 15 cross feed, 16 compound swivel, 17 tool post, 18 cone pulley, 19 spindle, 20 bearings, 21 thread for face plate, 22 set over adjustment, 23 tail spindle.

Sullivan Machinery Co., Chicago, has removed its Butte, Mont., office from 48 East Broadway to 54 East Broadway. It is in charge of James G. Graham.

Book Review

Metallographic Researches, by Carl Benedicks, 307 pages, cloth, 6 x 9 inches, published by McGraw-Hill Book Co., Inc., New York, and supplied by THE FOUNDRY, Cleveland for $4.00 and in London, 2-3 Caxton House, Westminster, for 20s.

During 1925 Dr. Benedicks delivered a number of lectures in the United States on metallography and related subjects which had been investigated at the Metallografiska Institutet at Stockholm, and these have been printed in book form. Considerable of the matter is original, not being published previously or published only partly in Swedish. Chapter I gives some points of view on the kinetic constitution of matter. Chapter II presents the results of experiments demonstrating the occurrence of thermoelectric currents in a homogeneous metal. Hardness, in general and in specific cases of steels and other alloys is the topic of chapter III. Meteoric iron and invar are discussed in chapter IV. In chapter V the author describes how to mount a microscope to make it vibration proof and gives data on improvements in high-power microscopy. Microchemical etching using a film of gelatine on the surface of the specimen and results obtained by this method are described in chapter VI. Chapters VII, VIII, IX, X and XI cover the following subjects: First Discoverer of the Critical Point *Ac* in Steel. Some Fundamental Factors for Obtaining Sharp Thermal Curves, Determination of the Specific Gravity of Molten Iron, A Rational Ingot Section for Hard Rolled Material, and the Action of Hot Wall and Its Influence on Rapid Corrosion of Water Tubes.

Contract Awarded to Austin Company

The Parkersburg Rig & Reel Co., Parkersburg, W. V., has awarded a contract for the first unit of its new plant to the Austin Co., Cleveland, engineers and builders. It will cost approximately $100,000 and will be 125 x 242 feet, with structural steel frame, steel sash and brick side wall construction. The building is expected to be completed within 90 days. Additional units will be built adjoining the unit just started. It is estimated that the total project will cost $500,000.

J. M. Thomas, Old Colony building, Chicago, has been appointed sales representative by the Wm. J. Sweet Foundry Co., Irvington, N. J.

Varied Time Required To Skin Dry a Mold

Question: We have an order for some castings in which the molds have to be skin dried. This is outside our regular province and we shall appreciate information on the subject, particularly the temperature and time required. We use a coarse, open grade of sand rammed in the flasks with a sand throwing machine.

Answer: The time and temperature required to skin dry a mold will depend on the size of the mold, available fuel and the method of application. For example to illustrate the two extremes, one large mold in the floor might require two days and a ton of coke. A small mold may be dried on the face by exposing it for 10 minutes to the heat from the outside of a stove, or in less than a minute with the flame from a torch. No definite rule can be laid down on the time and temperature. These two factors must be regulated in conformity with the requirements of the particular mold. To put it another way, the heat must be applied for a sufficient time to remove all moisture from the skin of the mold. Another factor enters here, because the skin varies in thickness. For small castings which are poured immediately after they are dried, a dried skin ⅛-inch thick is sufficient. For heavier castings and in molds that are not poured for some time after they have been dried, the sand forming the skin must be dried to a depth varying from ¼ to 1½-inch.

Practically any kind of fuel can and has been used in skin drying molds. Where natural gas is available it is used extensively. Cost of artificial gas bars its use except under special or extraordinary conditions. Charcoal still is used quite extensively in a basket or on a plate to dry the drag part of a mold while heat from the same fire dries the cope suspended above it. Wood is a satisfactory drying medium, but it has to be watched rather carefully to prevent it from burning the face of the mold. Many large molds are dried by closing them in a green state and then driving hot air into them through one or more pipes. A small fan first drives the air through a coke fire and heats it to a temperature of approximately 500 degrees Fahr.

Sometimes the time element is the deciding factor in the selection of a fuel. For example, small molds may be skin dried by placing them in the core oven. They may be dried much more rapidly with one of the various types of oil torches that now are available for foundry use although their use is not confined to small molds.

Assuming for the moment for the purpose of illustration that you have a mold for a 10-inch pipe 6 feet in length. Also we will assume that you have an oil torch. The face of the mold is painted with blacking that has been diluted in water containing a small quantity of molasses or any other water soluble core binder. After the blacking has been applied and if necessary slicked and repainted with a camels hair brush dipped in an exceedingly thin blacking mixture the operator lights a torch and walks back and forth while playing the flame on the face of the mold. By constantly shifting position the sand at any one point does not become burned, but the heat gradually penetrates until the sand is dried to a depth of approximately ½-inch. This will taken from 10 to 15 minutes. Some sand will stand a longer and fiercer flame than others, but the limit of any particular sand may be learned only by personal experience.

Faked Foundry Facts

Too Much Facing

The Molybdenum Corp. of America, Pittsburgh, has published a well illustrated catalog showing views of its mine and concentration plant at Red River, New Mexico and its smelter and refinery at Washington, Pa.

Hard Iron Balls Used in Grinding Clinker

Question: We have an inquiry from a cement manufacturer asking us if we can supply iron balls for grinding clinker. We are not familiar with the method of producing these castings or with the kind of iron required to pour them and will appreciate information on the subject.

Answer: Iron balls for grinding clinker in cement mills are made in immense quantities in both malleable and gray iron. The malleable iron castings are not annealed and the gray iron castings are poured from a mixture that will yield a white fracture. From your letter head we note that you make gray iron castings and therefore we submit a suitable analysis of iron to be melted in the cupola: Silicon from 0.90 to 1.00 per cent, sulphur 0.08 per cent, phosphorus 0.20 per cent, manganese 0.60 to 1.00 per cent. The qualities required in these castings is extreme hardness or resistence to abrasion. Two methods are employed for making the castings. In at least one large installation with an output of 20 days a day the iron is poured into large iron molds and the process is continuous. The molds are actuated by hydraulic plungers. After the metal has set, the mold is opened to allow the castings to fall on to a conveyor which loads them directly into a car without any intermediary cleaning. The car takes them to the battery of mills where they are used.

In the majority of plants the castings are made in green sand molds from a matchplate with several rows of half patterns on each side. Unless the main runner is generously proportioned and the pouring head a resonable height the castings will show a shrink hole on top. In many instances the top of the pattern is slightly flattened to prevent this.

See Princeton Bell Cast

Members of the American society in London, Eng., visited the foundry of Gillett & Johnston, bell founders, at Croydon on Jan. 27 and saw the casting of one of the bells for the carillon ordered for Princeton university. As the molten metal was being poured into the mold, A. H. Rowan, a Princeton graduate, threw in a silver coin for luck. The party also inspected a carillon of 43 bells which will hang in a Chicago church.

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in notebook form.

A LEXICON OF TECHNICAL TERMS

By O. W. Potter

METALLURGY

The science and art of preparing metals for commercial use from their ores by separating them from mechanical mixture and chemical combination. It includes various processes such as smelting, amalgamation, electrolytic refining, etc. Metallurgy has been generally understood as concerned only with the production of the raw materials and not the process which deals with their manufacure into finished articles. The casting, rolling, forging, shaping, and treating of metals has to some extent been referred to as a process of metallurgy. This is classified more generally under the art or science of *metallography*.

METALLOGRAPHY

The art or science of metals and metal working. This includes all such processes as casting, forging, rolling, drawing, and heat treating. It includes the study of physical and chemical properties along with the microscopic study of the microconstituents.

Chemical terms describing or pertaining to the properties of metals and alloys.

Symbol
Atomic weight
Valence (primary)
Valence (secondary)
Periodic Number
Adhesion
Cohesion
Amorphous
Crystalline
Isotropic
Anisotropic
Homogeneous
Heterogeneous
Stable properties
Metastable properties
Inertia
Allotropy
Specific gravity

O. W. Potter is connected with the University of Minnesota, Minneapolis.

(*Continued on Data Sheet No.* 658)

A LEXICON OF TECHNICAL TERMS

(*Continued from Data Sheet No.* 657)

Density
Specific volume
Chemical composition
Absorption
Corrosibility
Decrepitation
Distillation properties
Passivity
Solubility
Sublimation properties

Terms relating to or describing the general metallurgical properties.

Plasticity
Ductility
Malleability
Rigidity
Tenacity
Brittleness
Toughness
Elasticity
Elastic deformation
Plastic deformation
Brazability
Calorizing properties
Galvanizing
Sherardizing
Electroplating
Electrochemical cleaning
Pickling
Carburizability
Castability
Crystallization
Merit index
Self hardening
Temperability
Weldability

Terms pertaining to or describing the mechanical or strength properties of metals and alloys.

Static strength
Dynamic strength
Bending strength
Compressive strength
Fatigue Resistance
Fatigue strength
Notch toughness
Shear strength
Tensile strength
Torsional strength
Transverse strength
Elastic limit

(*Continued on Data Sheet No.* 659)

Seeing America with The Foundry

Little Journeys to the homes of our readers

CALIFORNIA has a total of 228 foundries of which

148 Melt Gray Iron
80 Nonferrous Depts. of other foundries
4 Melt Malleable Iron
24 Melt Steel
114 Melt Aluminum

CALIFORNIA—The Golden State—second largest in the Union in area and capable of accommodating 127 states the size of Rhode Island, probably overshadows in interest and popularity all other American commonwealths. The balmy climate of the greater part of the state, its towering mountains with their forest-clad slopes, its wealth of fruit and flowers, its rich mines of gold—all of these features have given California a very definite place in the mind and heart of the average American. The name "Golden State" refers to the historic discovery of gold in 1848, but there is much of romantic association in the name as well. The name, California is said to have come from that of a fabled island in the Pacific "on the right hand of the Indies and very close to the Earthly Paradise". It was said to be peopled with women who lived like Amazons. "Their arms were of gold, there was no metal but gold".

California has many profitable lines of manufacture. Of first importance is the lumber industry and the yearly output of timber products has a value approximating $45,000,000. Meat packing, the canning of fruits and vegetables, flour making, the manufacture of wines and olive oil and sugar refining are the other manufacturing industries of importance. For the operation and maintenance of these industries 228 foundries are at present established.

In CALIFORNIA—THE FOUNDRY has 309 paid subscribers

"Wherever metals are cast you'll find THE FOUNDRY"

WHAT OTHERS ARE THINKING

Abstracts Selected from the World's Foundry Literature

Casting of Light Alloys

W. R. D. Jones in a paper presented at the meeting of the Royal Aeronautical Society (*Foundry Trade Journal*, Nov. 11, 1926) stated that magnesium is quite active chemically at elevated temperatures, and in the molten condition will combine with the majority of other elements. It also dissolves large quantities of gases which are given off as the melt solidifies. Consequently it is not an easy matter to obtain sound castings. The metal must be melted in steel or iron crucibles because clay crucibles contaminate the melt with silicon and graphite crucibles promote carbide formation.

Sound ingots up to 4 inches in diameter; free from gas holes, slag inclusions, contamination and burning were obtained by the following method: A bottom-pour, forged-steel crucible is *broken in* by melting scrap magnesium metal to form a skin or protective coat on the walls. A flux of 3 to 4 per cent of the weight of metal, composed of anhydrous magnesium chloride and fluoride, is used. The flux is deliquescent and should be fused immediately before use. After the melt is teemed the crucible should be scraped and cleaned at once. Metal loss may be kept to a minimum by using sufficient but not too much flux and avoidance of overheating or soaking the metal.

Crucible, stopper, stirrer and lid are made red hot and cleaned. Charging is done at black heat to eliminate moisture which causes unsound castings. Alloying elements may be added as previous-cast, rich alloys or hardeners. The hardener is added near the center of the charge and flux distributed at regular intervals. When charged the lid is put on tightly.

Melting is done in a circular upright gas furnace. When the charge is melted, it is stirred thoroughly to incorporate the flux. The gas supply is shut off and the crucible allowed to cool slowly. When freezing is complete the metal is remelted as rapidly as possible without any stirring. The gas supply is lowered and the crucible allowed to rest for a few minutes. Then the crucible is removed and teemed into the mold placed an inch or so below.

For chill castings the molds of steel or iron should have a polished finish and show no tool marks as these may cause failures due to cracks. Molds are preheated to 350 to 400 degrees Cent. The melt should be teemed slowly on the tip of the mold near the top and somewhat on the sluggish side. Pouring should be without interruption. For sand castings a hard baked mold should be used, heated at 400 degrees Cent. Molds must be used immediately after removal from oven.

Gates should be as small as possible consistent with a free flow of metal. Length of runner should be half again as much as that used on aluminum alloys to obtain the same pressure. Castings are obtained easily with a silvery skin and no tendency for the sand to stick to the casting. The surface may be cleaned from sand by wire brushing.

Improves Qualities

Comparative Study of the Results Obtained in the Improvement of the Qualities of Castings—by L. Piedboeuf. *Revue de Fonderie*, Belgium, Oct. 1926.

According to the author high-resistance cast iron generally has a structure which is nearly entirely pearlitic. However, a high resistance has been obtained with irons having a pearlitic and ferrite structure when the graphite is distributed in sufficiently small flakes. He classifies high-resisting cast irons with the aid of Maurer's diagram. These irons contain generally less than 0.60 per cent phosphorous and from 0.50 to 1 per cent manganese; in such cast irons the structure depends upon the percentage of carbon and silicon and providing the cooling rate is maintained between certain limits. Tables showing the physical tests and compositions of various cast irons obtained by Bauer, Krupp, Thyssen-Emmel, Kerpely, Le Thomas, Varlet are presented. Maurer's diagram enables cast irons to be classified according to their percentage of carbon and silicon but without taking account of the percentage of combined carbon. The author refers to Portevin's diagram which takes this factor into account.

Chemistry of Annealing White Heart Malleable

Chemical Considerations Concerning the Annealing of White Heart Malleable Iron by Marcel Guedras *Fonderie Moderne*, Oct. 1926. In its first stage white heart malleable iron is a white iron in which all the carbon is combined as cementite. After having mentioned the hypothesis of Ledebur and Wust as to the process of decarburization, the author submits the following: Iron monoxide reacts on the cementite and liberates carbon and carbon monoxide; carbon monoxide reacts on the iron peroxide (Fe_2O_3) forming iron monoxide and carbon dioxide. Carbon dioxide reacting on the cementite eliminates the carbon. According to the theory, the zone of equilibrium is obtained between 700 and 900 degrees Cent.; in practice it extends to 950 degrees. The author states that it is essential to know the chemical composition of the cement. Knowing this composition, the percentage of carbon in the original cast iron and the thickness of the casting, it should be possible to determine the amount of ores necessary to arrive at a satisfactory result.

Describes Cupola

The Ironfounder and Direct Iron Production, by Charles Gilles, paper read at the meeting of the Austrian section of the German Society of Ironfounders, translation in the *Foundry Trade Journal*, Dec. 30, 1926. The author mentions various methods and processes for obtaining cast iron with a low content of total carbon and describes at some length the process developed by Corsalli in Germany. The cupola used differs from the ordinary one in that it has an auxiliary apparatus consisting of a pipe or tube built on the outside of the cupola. This tube enters the cupola at a point just above the tuyeres and extends vertically to a point in the stack considerably above the charging door. An opening closed with a flap door is on the level of the charging door.

This auxiliary apparatus is for the addition of the ferroalloys that are added to the charge. The charge or mixture consists of about 2/3 steel or wrought iron scrap and 1/3 runners and risers, and other scrap from the preceding heat. The mixture may be greater or smaller according to the nature of the castings. The charge has approximately the following analysis: Carbon, 1.0 to 1.2; silicon, 0.6 to 0.8; manganese, 0.3 to 0.4; phosphorus, 0.2 to 0.3 and sulphur, about 0.03 per cent. About 0.8 to 1 per cent silicon in the form of ferrosilicon is added with the charge and the necessary balance of silicon and manganese are fed into the bath in molten form by use of the auxiliary melting apparatus, heated by the ascending gases.

Fuel used is Westphalian foundry coke coated with lime sludge. Maximum charge coke is 10 per cent, and the blast volume is one and one half to two times as great as in ordinary cupola operation. Due to half the silicon and the major portion of the manganese being added through the auxiliary apparatus, the total silicon loss is from 15 to 20 per cent and the manganese loss is about 10 to 15 per cent. Carbon absorption from coke materially is reduced by the high blast employed. Sulphur rarely is above 0.12 per cent. Several analyses of the finished product are given and range as follows: Silicon, 1.97 to 2.44; sulphur, 0.90 to 0.120; phosphorus, 0.24 to 0.28, manganese, 1.23 to 1.45, and carbon, 2.64 to 2.82 per cent.

The iron is 1480 to 1500 degrees Cent. when it leaves the cupola. It also must be poured hotter than normal cast iron owing to its low carbon and phosphorus contents. For thin walled castings the phosphorus should be raised to 0.5 to 0.6 per cent. This process also may be used in making cupola malleable as the total carbon content of the metal is low.

The Shakeout

DAN M. AVEY, Editor

PAT DWYER, Engineering Editor
FRANK G. STEINEBACH, Associate Editor

CHARLES VICKERS, Nonferrous Editor
EDWIN BREMER, Associate Editor

¶ It Is Here To Stay

ON PARTICULARLY dark and gloomy days —orders few and collections slow—when the owner of a small foundry is inclined more than usual to magnify his troubles and to dismiss lightly any suggestion tending to show that the business has a single, solitary compensating feature, he takes a kind of melancholy pleasure in the reflection that it won't be long now until the small foundry is as dead and as obsolete as the dodo, the carrier pigeon or the buffalo. He reflects that these birds and animals at one time flourished in America to an almost unbelievable extent. Today only one or two eggs of the dodo are in existence. All that is left of the clouds of carrier pigeons that darkened the sky for miles, are a few stuffed specimens. A few mangy buffaloes cooped in city and national parks are all that remain of the vast rolling herds that in early days covered the prairies of the west as far as the eye could reach.

What about the foundry? Well, look at it. The modern trend of industry is toward the elimination of the small foundry. Statistics show that several hundred foundries went out of existence last year. The foundry business is dead, pumped dry, a sucked orange. He is sorry he ever entered it.

AS A man thinketh in his heart, so is he. The man who thinks he has not a chance is licked before he starts. A natural bent to pessimism which seems to afflict the majority of mankind has done more to halt the march of progress than any other single factor or probably any combination of factors responsible for the development or lack of development of the human race. The average man just naturally craves sympathy. When the enemy invades his country he wrings his hands, lifts up his voice and cries his woes aloud, instead of meeting said enemy with banner and brand and bended bow and giving him the surprise of his life.

Along certain lines the mass production foundries and the shops designed to handle an immense tonnage fulfill a necessary function in the general manufacturing scheme. The margin of profit on each casting is small, but in the aggregate it is large. The small shop cannot compete with these on a price basis. It does not need to. A sufficient volume of miscellaneous castings always will be required and the function of the small shop is to supply these castings at a price that will yield a profit. Many small foundries today are making money for their owners. They are managed by the up-and-at-'em boys who know their business, who know their costs and who most assuredly do not operate their shops as charity bureaus for the benefit of customers.

¶ Castings Light the Way

APPLICATION of cast parts to the manufacture of artistic lighting equipment was pointed out during the past year in one of the short articles devoted to various casting uses, which appear in each issue of THE FOUNDRY on the contents page. That a large tonnage of nonferrous castings is being consumed in the production of lighting fixtures was indicated further at the exhibition recently held at Cleveland under the auspices of the Artistic Lighting Equipment association.

Thousands of lighting fixtures were on display at the show, a large percentage of which were constructed of cast parts. Undoubtedly, a number of advantages arise from the use of castings in the various types of artistic equipment. Many intricate designs may be produced in the beautiful brasses and bronzes which would be impossible with other methods of construction. Mass effects are produced and exceptional strength is given the fixture by the cast parts. The fixture made of cast parts is pleasing to the eye.

Although the use of castings in the field is growing, the possibilities for future expansion are large. A little more sales talk on the advantages of cast parts should be exceedingly beneficial to foundries engaged in producing castings for artistic lighting equipment manufacturers.

Trade Trends in Tabloid

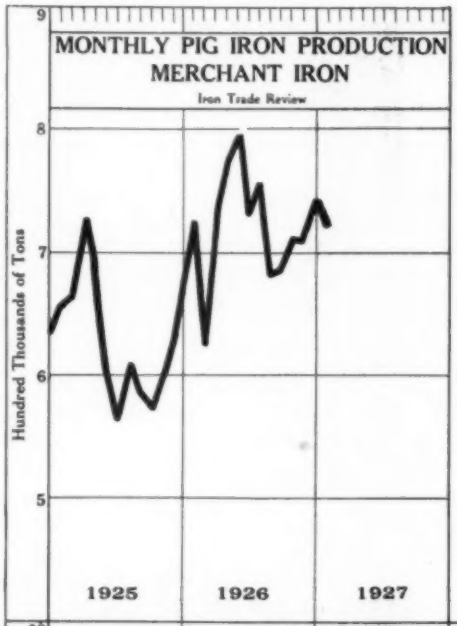
FOUNDRY operations vary widely in different sections of the country and in the various branches of the industry. Improvement in jobbing business is reported in the Philadelphia district. Ohio foundry operations in December were 82.4 per cent of normal, according to A. J. Tuscany, secretary of the Ohio State association. In the vicinity of Chicago and through the western portion of Illinois the average of foundry operations is high. Automotive demand has been slow, but improvement is expected with the advance of spring. Freight car awards hold out a promise for better business in steel and malleable foundries. The estimated total of car awards for January is given as 15,000 the best for any single month in more than a year. Car loadings this year have continued on a higher average than for corresponding weeks in 1926. Building activity is slightly curtailed. The total of business for 1926 fell behind 1925 by 5.9 per cent. The total production of pig iron, according to *Iron Trade Review* increased slightly in January. Merchant iron declined from 724,945 tons in January, compared with 743,612 tons in December. Average nonferrous prices in January, according to quotations in the *Daily Metal Trade* follow: Casting copper, 12.831c; electrolytic copper, 13.25c; Straits tin, 66.456c; lead, 7.584c; aluminum foundry ingot, 26.196c. Zinc average 6.674c, E. St. Louis, Ill.

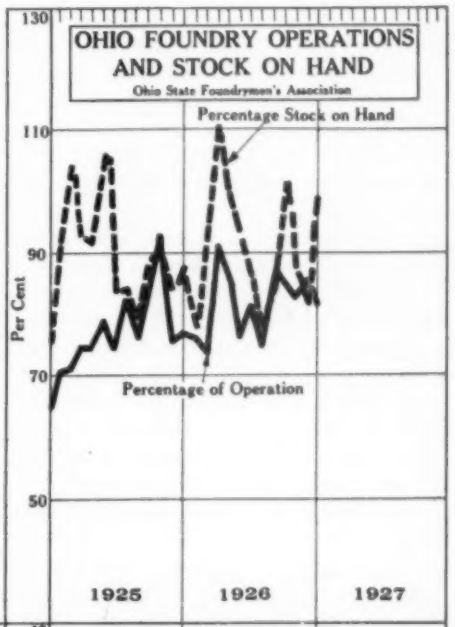
RAW MATERIAL PRICES

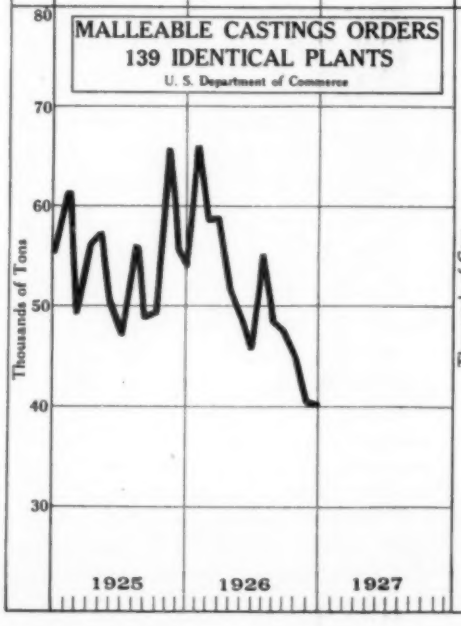
Iron

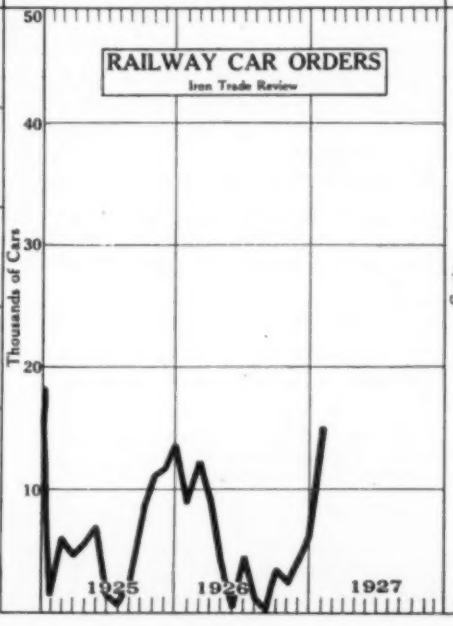
Feb. 8, 1927

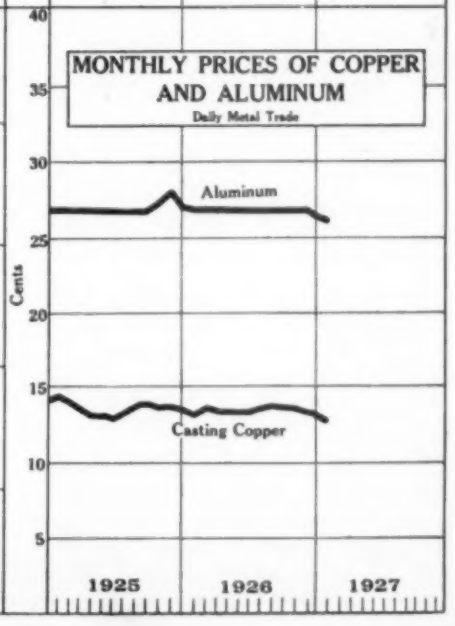
No. 2 foundry, Valley	$18.00 to 18.25
No. 2 southern Birmingham	18.00
No. 2 foundry, Chicago	20.50
No. 2 foundry, Philadelphia	21.76 to 22.26
No. 2 foundry, Buffalo	19.00 to 19.25
Basic, Valley	17.50 to 18.00
Basic, Buffalo	18.50 to 18.75
Malleable, Chicago	20.50
Malleable, Buffalo	19.00 to 19.25
Coke	
Connellsville foundry coke	$3.75 to 4.50
Wise county foundry coke	6.00
Scrap	
Heavy melting steel, Valley	$16.50
Heavy melting steel, Pitts.	15.75 to 16.25
Heavy melting steel, Chicago	13.00 to 13.50
Stove plate, Chicago	14.00 to 14.50
No. 1 cast, New York	13.00 to 13.50
No. 1 cast, Chicago	17.00 to 17.50
No. 1 cast, Philadelphia	17.00 to 18.00
No. 1 cast, Pittsburgh	15.50 to 16.00
No. 1 cast, Birmingham	16.00 to 17.00
No. 1 cast, Buffalo	16.75 to 17.25
Car wheels, iron, Pittsburgh	16.00 to 16.50
Car wheels, iron, Chicago	15.00 to 15.50
Railroad malleable, Chicago	16.00 to 16.50
Agricultural mal., Chicago	15.25 to 15.75
Malleable, Buffalo	17.00 to 17.50
Railroad malleable, Pitts.	16.00 to 16.50
Nonferrous Metals	Cents per pound
Casting copper, refinery	12.50 to 12.55
Electro copper, producers	12.50 to 12.62½
Straits tin	68.75
Lead, New York	7.40
Antimony, New York	15.12½ to 15.25
Nickel, electro	39.00
Aluminum, No. 12, prod'rs	24.50
Aluminum, No. 12 remelt	24.50
Aluminum, No. 12 remelt	24.50
Zinc, E. St. Louis, Ill.	6.60











Comings and Goings of Foundrymen

ALFRED G. MORENCY, former manager of the Morency-Van Buren branch, Scovill Mfg. Co., Sturgis, Mich., has purchased an interest in the Northern Indiana Brass Foundry Co., Elkhart, Ind., and has been elected president of the company.

Edward Marrow has been appointed manager of the Mansfield Foundry Co., Mansfield, Mass.

N. F. S. Russel, president of the United States Cast Iron Pipe & Foundry Co., Burlington, N. J., has gone south for a vacation.

Edward W. Beach has assumed the position of consulting engineer with the Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.

W. J. Merton, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been appointed chairman of the recommended practice committee of the American Society for Steel Treaters.

W. B. MacLeay, formerly foreman for Wilcox, Crittenden Co., Middletown, Conn., now is connected with the Becker-Swanson Dies Inc., Boston, as foreman in the crucible steel foundry.

George W. Kennedy was elected president and general manager of the Kelsey Wheel Co., Detroit, at a meeting of the board of directors held Feb. 2. Mr. Kennedy succeeds John Kelsey who died Jan. 19.

A. S. Anderson, formerly associated with the Standard Wheel Works and the Terre Haute Malleable & Mfg. Co., Terre Haute, Ind., has been employed as manager of the Berryhill Malleable Iron Co., Evansville, Ind.

James Thomas, for the past several years connected with the Penn Mold & Mfg. Co., Dover, O., has been appointed superintendent of the new foundry erected by the Shenango Furnace Co., Sharpsville, Pa.

Harry S. Bradley, president of the Penn Mold & Mfg. Co,. which recently was acquired by the Shenango Furnace Co., Sharpsville, Pa., will continue as president of the Penn company and will manage the combined mold business of both companies.

Harvey M. Rein has resigned as Youngstown district representative for the Mesta Machine Co., Pittsburgh, to join the sales department of the Aetna-Standard Engineering Co. Mr. Rein, previous to his connection with the Mesta company, was associated with the United Engineering & Foundry Co., and with the Youngstown Foundry & Machine Co.

H. K. Hathaway, secretary, the Industrial Association of San Francisco, San Francisco, recently resigned. The work of the association has been taken over by the Pacific Coast Founders' association of which D. B. Hindkley is managing director.

G. M. LAWRENCE

George B. Darby Jr., who has been secretary, treasurer and sales manager of the Lansdale Foundry Co. Inc., Lansdale, Pa., has resigned to become associated with the Soil Pipe association as commercial research engineer, and will maintain headquarters at Birmingham, Ala.

Bohumil A. Zikmund, production manager and assistant secretary of the Sivyer Steel Casting Co., Milwaukee, was promoted to treasurer of the company at the annual meeting in January. Mr. Zikmund has been with the company since 1912. Martin A. Fladoes, assistant sales manager of the Sivyer company was promoted to sales manager. He has been in the sales engineering department for 5 years.

Edwin H. Peirce has been selected as vice president and general manager of the Niles Tool Works Co., Hamilton, O. Mr. Peirce was graduated from Harvard university in 1904 and for the past 19 years has been associated with the American Steel & Wire Co. He was superintendent of the New Haven, Conn., works of this firm for about 6 years. For the past 2 years Mr. Peirce has been superintendent of the South works of the American Steel & Wire Co., Worcester, Mass.

A Correction

C. H. Burgston, formerly metallurgist for Deere & Co., Moline, Ill., has been appointed superintendent of the Union Malleable Iron Co., East Moline, Ill., and not assistant superintendent as noted in the Jan. 15 issue.

Appointed Sales Manager

G. M. Lawrence has been appointed sales manager by the United States Electrical Tool Co., Cincinnati. Mr. Lawrence has been with the firm for more than seven years and before his promotion was district manager in the Cleveland branch office.

Presents Resolutions

The board of directors of the American Foundrymen's association has presented resolutions of appreciation to H. Cole Estep, Penton Publishing Co., Cleveland, chairman of the American Foundrymen's committee on international relations, in recognition of his efforts in conducting negotiations and making arrangements for the visit of the American delegation to the First International Foundrymen's congress held in Paris in 1923 and for his work during the Second International Foundrymen's congress which was held in Detroit in September, 1926.

Equipment Manufacturers Hold Meeting

At the annual meeting of the association, at Cleveland, Feb. 1, Thomas W. Pangborn, Pangborn Corporation, Hagerstown, Md., was unanimously elected president for the ensuing year. S. C. Vessy, W. W. Sly Mfg. Co., Cleveland, was chosen vice president and H. Cole Estep, Cleveland, was re-elected secretary-treasurer. E. O. Beardsley, Beardsley

& Piper Co., Chicago and N. S. Lawrence, Whiting Corp., Harvey, Ill., were elected directors for three years from Feb. 1, 1927

The reports on business conditions in the foundry equipment field indicated that although there may be some uncertainty concerning the outlook for the whole year, the first quarter will bring satisfactory returns equal to the rate of operations last year.

Addresses were given at the meeting by W. J. Barrett, policyholders' service bureau, Metropolitan Life Insurance Co., New York and Dan M. Avey, editor, THE FOUNDRY, Cleveland.

New England Association To Hold Meeting

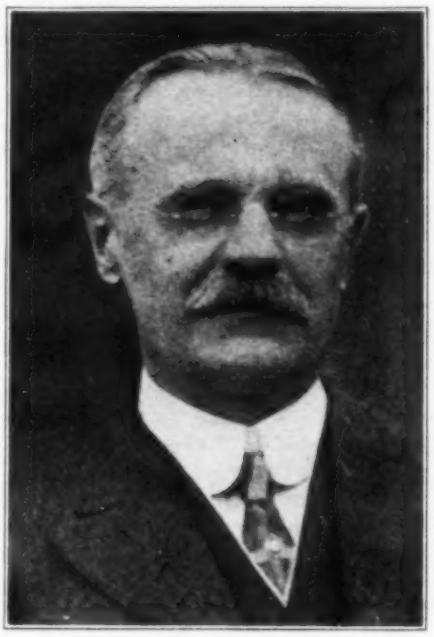
The value of alloys in cast iron was the subject of a paper by D. M. Houston, International Nickel Co., New York, which was presented at the meeting of the New England Foundrymen's association held at the Exchange club, Boston, on Feb. 9.

Hold Conference on Heat

A four-day session on electric heat was held recently by the department of engineering extension of the Pennsylvania State college, State College, Pa. Papers were presented by Wirt S. Scott, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; Edward R. Williams, Vulcan Mold & Iron Co., Latrobe, Pa.; J. Kniveton, F. J. Ryan Co., Philadelphia; N. R. Stansel, General Electric Co., Schenectady, N. Y.; Bruce E. Maxson, American Laundry Machinery Co., Cincinnati; Prof. J. B. Shaw, department of ceramics, Pennsylvania State college; C. J. Russell and A. D. Spillman, Philadelphia Electric Co., Philadelphia; G. L. Simpson, Pittsburgh Electric Furnace Corp., Pittsburgh; Prof. A. O. Knight, Pennsylvania State college; Harry E. Martin, Dodge Bros. Inc., Detroit; Horace Drever, Philadelphia; A. H. D'Arcambal, Pratt & Whitney Co., Hartford, Conn.; Stanley P. Rockwell, Stanley P. Rockwell Co., Hartford, Conn.; E. D. Doyle, Leeds & Northrup Co., Philadelphia; William Adams, Ajax Metal Co., Philadelphia; and Prof. O. B. Malin, Pennsylvania State college. Professors from the various departments of the Pennsylvania State college presided over the sessions which were held in the morning, afternoon and evening. At the banquet held during the conference, Pat Dwyer, engineering editor, THE FOUNDRY, Cleveland, gave an address on the evolution of the foundry industry.

H. J. Boggis Is Dead

Hebert J. Boggis, who was prominently indentified in the foundry business of Cleveland, died Feb. 2 at his home in Shaker Heights from injuries sustained when struck by an automobile, Dec. 24, 1926. He was born in Lock Haven, Pa., in 1862 and attended Yale university from which he was graduated in 1885. Mr. Boggis began work with the McIntosh-Huntington Co., and entered the employ of the Taylor & Boggis Foundry Co., Cleveland, in 1886. In the fall of 1887 he became secretary of the company and in 1890 he took charge of the No. 2 foundry. At the death of his father in 1910 he took entire charge of the firm. Mr. Boggis was a vice president of Taylor & Boggis until it became a division of the Consolidated Iron & Steel Mfg. Co., Cleveland in 1918. He was a member of the Cleveland chamber of commerce and was indentified prominently with other business organizations.



HERBERT J. BOGGIS

Obituary

John Kelsey, president of the Kelsey Wheel Co., Detroit, died Jan. 19 at Detroit.

J. B. Colvin, founder and head of the J. B. Colvin Foundry, Worcester, Mass., died recently. He was 70 years old.

Edward L. Estabrook, head of R. Estabrook Sons Co., South Boston, Mass., died recently at his home in West Newton, Mass.

Asa W. LaFrance, one of the founders of the American LaFrance Fire Engine Co. Inc., Elmira, N. Y., died at his home in that city Jan. 23, aged 82 years. Mr. LaFrance served during the Civil war with the First New York cavalry. He became interested in the American LaFrance company in 1870 and continued active in it until 1905.

De Coursey Cleveland, president of the Medina Iron & Brass Co., Medina, N. Y., died Jan. 25. He was born in Short Hills, N. J., in 1876 and was educated in New York City. He prepared to enter Columbia university but went into business instead. Mr. Cleveland was president of the Central Foundry Co., New York for 18 years. He left that firm to form a connection with one of the Medina, N. Y., foundries and later took over the Medina Iron & Brass Co.

Dr. Jesse T. Duryea, president of the Pierce, Butler & Pierce Mfg. Corp., New York, builders of boilers and engines, died Jan. 30 at Alburquerque, N. M., at the age of 61 years. He formerly was superintendent of Brooklyn hospitals but later in life turned from medicine to business. Dr. Duryea was chief executive of the Wolf Mfg. Co., until it was made a part of the Pierce organization. He was a director of the By-products Coke Co. and other corporations.

George M. Landers, Landers Frary & Clark, New Britain, Conn., died at his home in New York on Jan. 25. He was graduated from Yale university in 1894 and entered the firm of Landers, Frary & Clark which was founded by his grandfather, George M. Landers. From 1906 until his resignation in 1911, he served as vice president, secretary and treasurer. Later he returned to the company as manager of the New York office and until his death continued to serve as a director. In recent years Mr. Landers also had been president of the North & Judd Mfg. Co. and the Pressure Lighting Co., New Britain. He served as mayor of New Britain for two terms.

John E. Sperry, president of the Sperry Foundry Corp., Oneida, N. Y., died on Jan. 20 from apoplexy. Mr. Sperry was born in West Monroe, N. Y., Feb. 15, 1848, and received his education in the public schools of that place and in a seminary at Fulton, N. Y. For several winters he was engaged in teaching at West Monroe and Bernhard's Bay. His first business experience was as a general merchant in his native town. In 1889 he went to Elbridge, N. Y., where he conducted a large general store until 1893 when he removed to Munnsville,

N. Y. Here Mr. Sperry purchased an interest in the firm of Stringer, Dexter & Paul, manufacturer of plows and other farm implements. Later, this concern became the Munnsville Plow Co., which under Mr. Sperry's able supervision as president built up an extensive business. Fire destroyed this plant a few years ago and he transferred his activities to Oneida, N. Y., conducting the Sperry foundry. He was 79 years old.

Arcade Manufacturing Co. Opens New Foundry

A new foundry addition having a floor space of 40,000 square feet formally was opened by the Arcade Mfg. Co., Freeport, Ill., Jan. 31. The 425 employes of the company and about 200 guests, including representatives of various industries throughout the country and representative business and professional men of Freeport were guests of the company at a luncheon served in the new plant.

About 1880, E. H. and Charles Morgan engaged in the manufacture of agricultural machinery such as feed grinders and plows. This line was continued until 1884 when they started the manufacture of box coffee mills and formed the company which now is known as the Arcade Mfg. Co., and which was incorporated in 1885.

The company began the manufacture of toys about 30 years ago. As its first hardware item had been a coffee mill, so its first toy was a miniature coffee mill. About the same time, the company also introduced another item known as a midget sawbuck. With these two toys as a beginning, the company gradually increased its line of cast iron toys until today approximately 300 toys are made. The company also produces a line of cast hardware, as well as a line of molding machines and foundry equipment.

The officers of the Arcade company are as follows: President E. H. Morgan, vice president L. L. Munn, treasurer B. C. Trueblood and secretary I. P. Gassman. The operations of the company are divided into 26 departments with the following foremen in charge: Iron foundry, Herman Kutz; brass pattern, Del Sward; core room, Paul Bessert; grinding room, William Shively; brass foundry, Charles King; japan room, Frank Voss; wire forming, John Moore; punch press, Henry Lindelsee; polishing and plating, L. E. Shaw; toy paint shop, Fred Lieber; woodshop, Ernest Yordy, varnish rooms, Fred Raih; coffee mill assembly, Max Buegel; fish spear, Louis Steigman; refrigerator hardware, William Entmeier; specialty, Bert Herbig; general packing, Elias Matter; shipping room, George Krieg; tool room, Fred Sward; machine shop, Gustave Dahl; molding machine assembly, A. Rampenthal; wood pattern shop, Otto Kuchenmeister; snap flask, John Smith; blacksmith shop, Henry Hill; warehouse, Morrie Belknap; and power plant, John Keller.

Philadelphia Foundrymen Hear Talk

The 361st dinner and meeting of the Philadelphia Foundrymen's association was held at the Manufacturers' club, Philadelphia, on Feb. 9. The speaker of the evening was Dan M. Avey, editor, THE FOUNDRY, Cleveland. Several questions were discussed including the use of clay wash in connection with sand, placing and size of heads, causes of core blows. New members of the association are the Fuller-Lehigh Co., Fullerton, Pa., and Fisher & Norris Anvil Works, Trenton, N. J.

Hold Sales Convention

The annual sales convention of the Independent Pneumatic Tool Co., Chicago, was held from Jan. 17 to 22. Sessions for the first four days were held at the factory at Aurora, Ill., and the annual banquet was held on Wednesday night at the Aurora hotel. The convention then adjourned to Chicago where the last two days were spent at the general offices of the company. Managers of various branch offices, the staff of the Chicago office and others attended the meetings.

Foundry Association Directory

American Foundrymen's Association

President,, S. W. UTLEY, Detroit Steel Casting Co., Detroit; secretary-treasurer, C. E. HOYT, 140 South Dearborn street, Chicago; technical secretary, R. E. Kennedy, 909 W. California street, Urbana, Ill.

The Buffalo Foundrymen
Buffalo

President, J. MCARTHUR, Washington Iron Works; secretary, W. J. WARK, E. J. Woodison Co., 146 Chandler street. Meetings the third Wednesday of the month at 146 Chandler street.

Chicago Foundrymen's Club
Chicago

President, G. H. ROLINSON, American Brake Shoe & Foundry Co., Chicago. Meetings second Saturday in each month at the City club, 315 Plymouth court.

Connecticut Foundrymen's Association

President, FRED W. STICKLE, Capitol Foundry Co., Hartford, Conn.; secretary, C. S. NEUMANN, Union Mfg. Co., New Britain, Conn. Meetings are on second Friday of each month in various parts of the state.

Detroit Foundrymen's Association
Detroit

President, ROBERT G. CRAWFORD, Atlas Foundry Co., 131 South Artillery street, Detroit; secretary, RUSSELL M. SCOTT, Packard Motor Co., 1580 East Grand boulevard, Detroit. Meetings third Thursday in each month at the Union League club, 35 Grand River avenue, Detroit.

Metropolitan Brass Founders' Association
New York

President, WILLIAM EMBER, Jefferson Brass Foundry, 62 Delevan street, Brooklyn, N. Y.; secretary WILLIAM E. PAULSON, Thomas Paulson & Son Inc., 97 Second avenue, Brooklyn, N. Y. Meeting second Wednesday in each month at the Building Trades club, 34 West Thirty-third street, New York.

Newark Foundrymen's Association
Newark, N. J.

President, J. L. CARTER, Barlow Foundry Inc., Newark; secretary, W. H. MANTZ, Atlas Foundry Co., Irvington, N. J. Meeting called by president.

New England Foundrymen's Association

President, HENRY S. CHAFEE, Builders Iron Foundry, Providence, R. I.; secretary, FRED F. STOCKWELL, 205 Broadway, Cambridgeport, Mass. Meetings second Wednesday of each month at the Exchange club, Boston. Outings usually are held in the summer months.

Ohio State Foundrymen's Association

President, WALTER L. SEELBACH, Walworth Run Foundry Co., 2488 West Twenty-seventh street, Cleveland; secretary-manager, ARTHUR J. TUSCANY, 5713 Euclid avenue, Cleveland.

Philadelphia Foundrymen's Association
Philadelphia

President, WALTER WOOD, R. D. Wood & Co., Philadelphia; secretary HOWARD EVANS, Union League club, Philadelphia. Meetings the second Wednesday of each month at the Manufacturers' club.

Pittsburgh Foundrymen's Association
Pittsburgh

President, LAWRENCE V. STEVENS, Locomotive Stoker Co., N. E. Pittsburgh; secretary-treasurer, WILLIAM J. BRANT, Wm. J. Brant, Bessemer building, Pittsburgh. Meeting on the third Monday of the month, except in July and August, at Fort Pitt hotel.

Quad-City Foundrymen's Association
Davenport, Iowa

President, J. H. DIEDRICH, Blackhawk Foundry & Machine Co., Davenport, Iowa; secretary-treasurer, A. D. ZIEBARTH, Davenport Foundry & Machine Co., Davenport, Iowa. Meetings the third Monday evening of each month, the meeting place being rotated between Moline, Rock Island and Davenport.

Southern Metal Trades Association
Atlanta, Ga.

President, GEORGE B. COCKER, Gastonia, N. C.

Tri-City Technical Council
Moline, Ill.

Chairman, H. BORNSTEIN, Deere & Co., Moline, Ill.; treasurer, MAX SKLOVSKY, Deere & Co., Moline, Ill. Combined meetings held only one or two times a year on call.

Tri-State Foundrymen's Association
Cincinnati

President, HAROLD P. RITTER, John A. Oberhelman Foundry Co., 3323 Colerain avenue; secretary, GEORGE W. PIEHL, Wessling Bros. Foundry Co., 1607 McLean avenue. Meetings the second Thursday of each month at the Cincinnati club, Eighth and Race streets.

Twin City Foundrymen's Association
Minneapolis-St. Paul

President, J. A. TEACH, Minneapolis Steel & Machinery Co., Minneapolis; secretary-treasurer, C. E. LANGDON, 3849 Lyndale avenue, So., Minneapolis. Meetings monthly at the Athletic club.

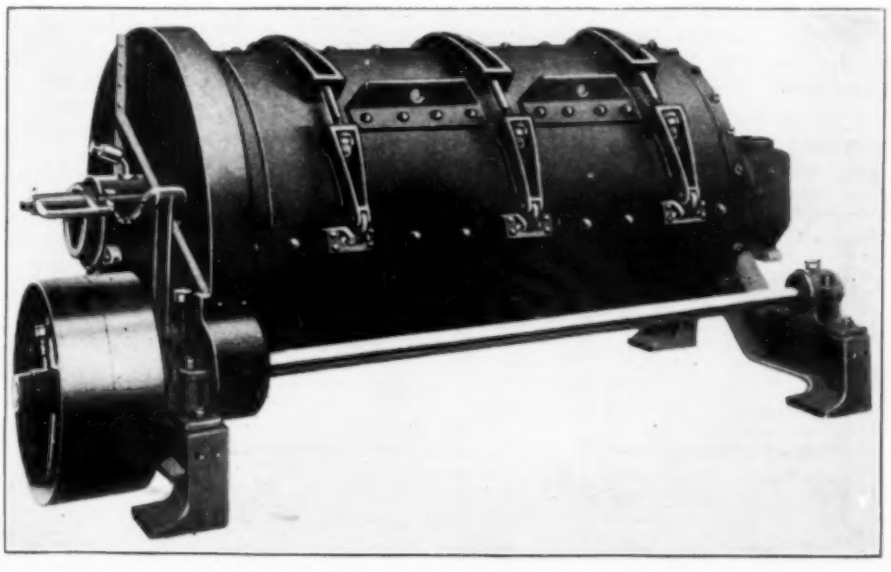
Special Doors Used on Tumbling Mill

A number of improvements have been made in the line of tumbling mills manufactured by the Whiting Corp., Harvey, Ill. The door clamp consists of cast steel sliding bars arranged in pairs and mounted on the door, cast steel links connecting the bars to the side of the barrel and 1¼-inch diameter tension bolts for drawing the bars together tightly when the door is in place. The sliding bars are mounted in such a way that they pivot as well as slide, permitting alignment in all directions.

The door which is shown in the accompanying illustration, is lifted into place, the links swung into sockets that are riveted to the sides of the barrel and tension bolts turned up with a socket wrench. The links provide a toggle action which pinches the door tightly against the shell, while the tension on the bolts pulls the sides of the shell firmly against the door.

Trunnions are of a special alloy metal having a hard, tough surface. They are gaged to fit in a deep counterbore in the head and are held in place securely by bolts. The trunnion bearings are of the ball and socket type and are self-aligning in all directions. They are provided with pressure grease lubrication.

Both the driving gear and pinion are guarded with welded steel housings. The cast iron heads are ribbed on the inside. The ribs are placed so that dirt coming from the inside of the barrel is raised by the rotation of the tumbler and discharged through the hollow trunnion by the exhaust. The trunnion is fitted with a substantial cast iron dust box with exhaust pipe connection. All parts of the mill are made from templates, are interchangeable and may be replaced quickly when worn out.

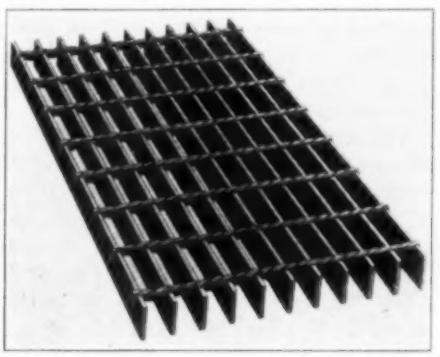


THE POSITIVE DOOR CLAMP IS A FEATURE OF THIS TUMBLING MILL

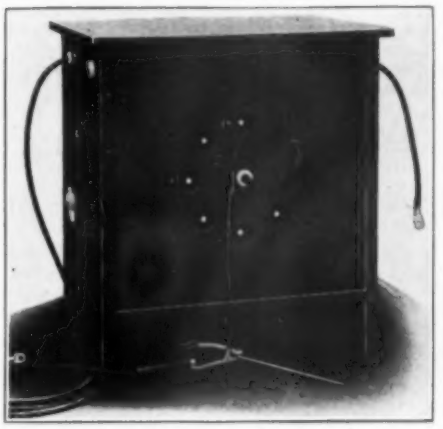
Builds Steel Grating

The Blaw-Knox Co., 602 Farmers Bank building, Pittsburgh, recently has placed a new type of steel grating and flooring on the market. This grating is made by a resistance welding process in which the longitudinal bars and cross bars are welded into one piece. It is claimed that the design of the grating prevents slipping.

The standard grating, a section of which is shown in the accompanying illustration, contains eleven longitudinal bars to the foot and cross bars at the top are spaced on 2½-inch centers. The longitudinal bars are ⅛ and 3/16-inch thick as required. The cross bars are of sufficient section to brace and develop properly the full value of the longitudinal bars. It is claimed that the method of construction greatly facilitates the production of this type of grating to suit any floor conditions.



THE BARS ARE WELDED INTO ONE PIECE



ALTERNATING CURRENT IS USED IN THIS WELDING MACHINE

New Electric Arc Welder Is Portable

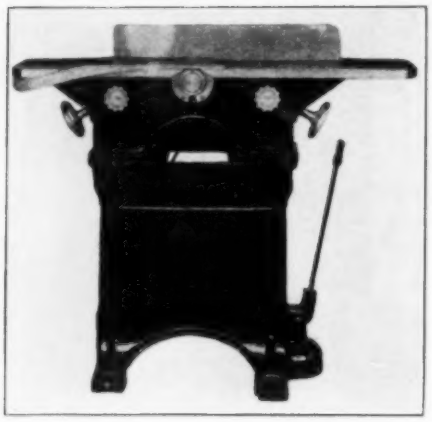
The Monarch Electric Welder Co., Des Moines, Iowa, has developed an electric welder which operates on alternating current. It is claimed that this type electric energy enables the operator to obtain excellent penetration, and with electrode metal fusing at a uniform rate, a sound weld may be made.

Special feature of the new machine is a series of new impedance coils fabricated from low annealed steel containing a percentage of manganese. Thirteen of these impedance coils are arranged around two bands of hot-rolled steel. The coils are connected with power plugs to terminals arranged systematically on the front surface of the casing, which is made of steel sheets. Each plug, which is of varying amperage, serves from a certain number of coils, either four or one as desired by the operator.

An electrode holder is provided which may be used on any length of cable up to 500 feet. A cable length in excess of 500 feet will result in a loss of voltage. The machine weighs 275 pounds and occupies only three cubic feet. Power may be obtained from either 220 or 110-volt circuits.

Blake & Knowles Plant To Be Closed

According to a report recently made by George P. Aborn, manager, the Blake & Knowles plant of the Worthington Pump & Machinery Corp., East Cambridge, Mass., that plant will be dismantled gradually and the operations removed to other plants of the corporation. The Blake & Knowles unit is one of the oldest pump building plants in New England.



THE JOINTER MAY BE BELT DRIVEN OR DIRECT CONNECTED TO THE MOTOR

Motor Driven Jointer Has Safety Features

A motor-driven hand jointer recently has been introduced by the F. H. Williams Co., 424 North Park avenue, Meadville, Pa. The jointer is supplied with a 6-inch round safety head, three knives, and is ball bearing throughout. The machine either may be direct-connected to a motor by bracket at the rear of the machine, or belt driven from a motor bolted to a bracket at the base.

The front table is 24 inches long and the rear table 18 inches long. The jointer is supplied with a single phase, 60-cycle, 110 volt, alternating current motor with a speed of 3400 revolutions per minute. The machine also has a fence 22 inches long and 4 inches high tilting at an angle of 45 degrees and an aluminum guard which automatically covers the knives to within 1 inch of the fence when not in use.

Twin City Foundrymen Hold Meeting

Members of the Twin City Foundrymen's association heard an address by Frederick A. Smith, sales department, American Foundry Equipment Co., Mishawaka, Ind., at the January meeting held at Minneapolis.

Measures Temperature by Radiation

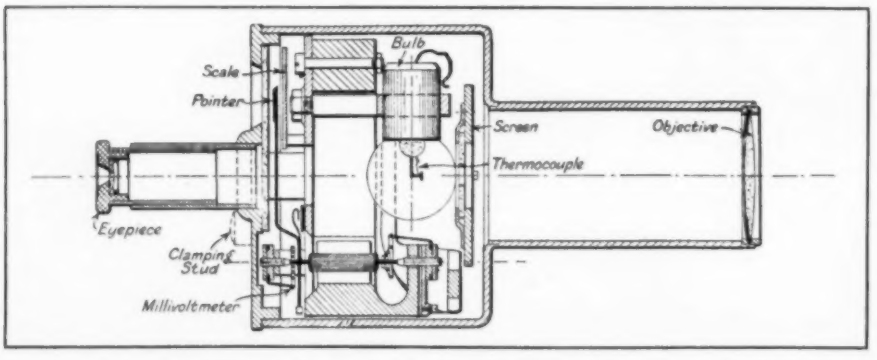
A development of the total radiation type of pyrometer is being placed on the market by the Pyrometer Instrument Co., 74 Reade street, New York. The fundamental principle of a radiation pyrometer of this class is the measurement of the total radiant energy, that is both heat and light waves, emitted by a hot body, whose temperature is to be obtained. In commercial pyrometers of this type a predetermined portion of the radiation emitted by the hot body is concentrated an a sensitive element, causing a measurable force to be developed in this element.

The new instrument is of the fixed focus type, in which the focal distance between lens and thermocouple is not adjustable by the operator. A screen with a central opening is interposed in front of the thermocouple to control the distance factor and to cut off side rays radiated from outside the field of vision.

The average type pyrometer instrument distributed by the Pyrometer Instrument Co. has a distance factor of between 24 and 30, depending on the temperature range. This means that the distance of the instrument from the aperture may be as great as 24 to 30 times the diameter of the aperture. The company has constructed instruments with a distance factor of 40.

A striking feature of the design is the incorporation of a milivoltmeter, thermocouple and optical system in a single unit, eliminating such accessories as cable connection and focussing adjustment. The only manipulation required by the operator consists of declamping the pointer by pressure of the thumb.

Another feature is the compact shape and the light weight of the instrument. A sectional drawing of the pyrometer and a view of the instrument are shown in the illustrations which are shown below.



SKETCH OF THE WORKING PARTS OF THE PYROMETER

DIRECT MOTOR DRIVE ALSO MAY BE USED

Drill Uses High Speeds

A new 12-inch high-speed drill has been designed by the Buffalo Forge Co., Buffalo, to run at speeds of 3600, 4800, 7200 and 10,000 revolutions per minute. The machines are tested at 12,000 revolutions per minute to insure a positive margin of safety.

The drill, which has an overall height of 34 inches, is shown in the accompanying illustration. The travel of the spindle is 3½ inches, the maximum height of the spindle to the table is 6½ inches and the spindle diameter is 7/16-inch. The speed of the drive pulleys is 1800 revolutions per minute. The machine drills to the center of a 12-inch circle.

The drill may be belt driven or is being constructed for direct motor drive, using a ½-horsepower electric motor. Ball bearings are used throughout.

Quad City Association Meets in Moline

Sandblasting was discussed by Robert F. Holland at the meeting of the Quad City Foundrymen's association which was held at the Le Claire hotel, Moline, Ill., on Feb. 7.

THE INSTRUMENT IS COMPACT

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Barnes Mfg. Co., Middletown, O., will construct a new foundry addition 60 x 185 feet.

Kohler Co., Kohler, Wis., manufacturer of sanitary ware, will build an addition to its enameling plant to double its capacity.

John Savage, Oskaloosa, Iowa, is having plans drawn for a 2-story foundry 40 x 120 feet.

Massey-Harris Co., Toronto, Ont., is receiving bids in connection with the addition to its plant to cost $15,000.

Caldwell-Watson Foundry & Machine Co., Birmingham, Ala., has changed its name to Caldwell Foundry & Machine Co.

Keeley Stove Co., Columbia, Pa., has begun work on the erection of an additional enameling plant.

Lennox Heater Co., Marshalltown, Iowa, has beeen incorporated as a subsidiary of the Lennox Furnace Co., to manufacture heating equipment.

B. T. Earle, 248 Pine street, Spartanburg, S. C., has started construction of foundry and machine shop 25 x 100 feet, to be completed early this year. (Noted Feb. 1)

Chicago Steel Foundry Co., Kedzie avenue and Thirty-seventh street, Chicago, is inquiring for a small hammer forge, board drop hammer and 72-inch vertical boring mill.

Gate City Iron Works, Eleventh street and Seward avenue, Omaha, Nebr., plans the erection of a foundry and machine shop, and an addition to the steel fabricating plant.

Chicago Bronze Co., 110 West Lake street, Chicago, has been incorporated with $15,000 capital to manufacture bronze by Flora Geisenheimer, Marvin Cohn and William Littman.

Hanover Steel Foundries Co., Dayton, O., R. H. Boyer, manager, 210 West Second street, has been incorporated with $50,000 capital to manufacture alloy steel castings.

Monarch Brass Co., Milwaukee, has been incorporated with $18,000 capital to manufacture brass goods by Leo K. Bruckner, 749 Booth street, and associates.

Cartaret Foundry Co., 2 Pacific avenue, Jersey City, N. J., manufacturer of sash weights and other foundry products, will build a 2-story addition (Noted Dec. 1, 1926)

Foundry and pattern shop of Darling Bros. Ltd., Montreal, Que., was damaged by fire on Jan. 19, entailing a loss estimated at $75,000.

Worthington Pump & Machinery Corp., New York, has purchased the assets of the Harris Air Pump Co., Indianapolis. The latter company manufactures air lift systems and pumps.

W. P. Murphy, Syracuse, N. Y., has been incorporated with $25,000 capital to manufacture stoves and furnaces, by W. P. Murphy, H. S. Murphy and W. S. Murphy. Hayden & Setright is attorney.

Coghlin Foundry Co., Detroit, has been incorporated to engage in general foundry and machine shop business by H. A. Coghlin, 1521 Longfellow avenue, Edward J. Corbett and Walter L. Coghlin.

Western Foundry & Furnace Co., 3002 South Chandler street, Tacoma, Wash., has bought additional land adjoining plant for erection of office building, removal of offices giving additional manufacturing space, for which sheet metal manufacturing machinery will be required.

Buckeye Pattern Works Co., Dayton, O., has been incorporated with $10,000 capital to manufacture patterns, by Franklin O. Hilier, Leah B. Hahn, Morris L. Hahn, Eva Marie Hiller and Royal J. Greene.

B. & F. Mfg. Co., Indianapolis, L. S. Foerderer, secretary and treasurer, 2007 Ludlow avenue, is having plans drawn for a 1-story foundry 60 x 100 feet. E. Doeppers, 226 East Michigan street, is architect.

Pittsburgh Die Casting Corp., Swissvale, Pa., Frank N. Townsend manager, 7505 Ardmore street, is considering a new plant and office building at Waverly avenue and Ardmore street. (Noted Dec. 1, 1926)

Michigan Foundry & Machine Co., Kalamazoo, Mich., has been incorporated to operate a general foundry business by Gerhard W. Mockly, 603 West Vine street, Ruth Mockly and Conrad Schopp.

Montpelier Foundry & Machine Co., Ft. Wayne, Ind., has been incorporated with 1250 shares no par value to operate a foundry and machine shop by Max B. Fisher, William L. Mollering and John M. Landenberger.

Hutchings Valve Co., Olean, N. Y., has been incorporated with $100,000 capital to manufacture pipe fittings by J. R. Allen and J. L. Hutchings. J. P. Quigley, Olean, N. Y., is attorney.

Wallace Machine & Tool Co., Indianapolis, has been incorporated with $10,000 capital to operate a foundry and machine shop by Frank B. Wallace, Retta B. Wallace and Roland E. Pavey.

New York state reformatory, Elmira, N. Y., F. L. Christian superintendent, is having plans made by S. W. Jones, state architect, capitol building, Albany, N. Y., for a foundry plant at the reformatory.

Walsworth Ltd., Montreal, Que., has been incorporated to manufacture and deal in furnaces, stoves, boilers, sinks, etc., with $20,000 capital stock, by Harold E. Boston, C. H. Mockridge, Frederick A. Burgess and others.

Skinner Co. Ltd., Gananoque, Ont., manufacturer of automobile accessories, hardware, etc., is having plans prepared by W. G. Galbraith, 615 Yonge street, Toronto, for a $50,000 addition to its plant.

The hardware department of the Taylor-Forbes Co., Guelph, Ont., was damaged by fire Jan. 12. J. M. Taylor, president and general manager announced that the plant will be rebuilt immediately.

East Penn Foundry Co., Macungie, Pa., just has placed in operation its new foundry addition which practically will double the company's capacity. The firm specializes largely in soil pipe.

Detroit Gray Iron Foundry Co., 6603 Wight street, Detroit, has given general contract to Malow, Barry Co., 2631 Woodward avenue, for a 2-story building, 70 x 100 feet. Milder & Eisen, Hammond building, are architects. (Noted Oct. 15, 1926)

Lincoln Foundry & Mfg. Co., School and Bristow streets, Belleville, Ill., has been incorporated with $25,000 capital to engage in the general foundry business, by Hugo H. Ehret, Alex Ehret and Erwin Ehret. Farmer & Klingel is correspondent.

Tampa Shipbuilding & Engineering Co., Tampa, Fla., Ernest Kreher president, will start soon on the initial unit of its plant on Nineteenth street, 320 x 400 feet, including foundry, fabricating plant, machine shop and other departments.

Hill-Wallisch Bronze Co., Pittsburgh, has been incorporated with $50,000 capital to manufacture brass and bronze castings and machine work by Lawrence A. Wallisch, 7238 Idlewild street, Bruce U. Hill, 7254 Mt. Vernon street, Pittsburgh, and George E. Hill, Butler Pike road, Glenshaw, Pa.

Gartshore-Thompson Pipe & Foundry Co. Ltd., Hamilton, Ont., has completed arrangements to manufacture cast iron pipe by the centrifugal process in sand molds. The firm is having plans prepared for a foundry building to accommodate the new process. Other equipment also will be installed.

Shenango Furnace Co., Pittsburgh, has acquired control of the Penn Mold & Mfg. Co., Dover, O., manufacturer of ingot molds and general castings. Harry S. Bradley, president of the Penn company will continue in that capacity in charge of the combined ingot mold business of the Penn company and the Shenango company.

Lancaster Iron Works, 126 North Water street, Lancaster, Pa., recently removed into a larger plant which formerly was occupied by the Monitor Bi-Loop Radiator Co., that city. It is believed that the Lancaster company will continue to occupy part if not all of its former plant which includes a machine shop. The firm does a jobbing business.

Universal Brass Works, Indianapolis, E. S. Harter, secretary and treasurer, 139 South East street, has let general contract to J. E. McGaughey, 322 American Central Life building, for a 1-story brass foundry 63 x 103 feet at Twenty-ninth and Martindale streets. Is also planning 1-story structure 70 x 103 feet for machine, pattern and plating shops.

Jeffrey Mfg. Co., Columbus, O., is celebrating its semicentennial this year. Its first product was a machine for cutting coal mechanically on which new types of chain were used for power transmission. This chain was adapted to driving feed rolls in rolling mills. This type of chain, with suitable attachments, then was adapted to conveyors of various sorts. From these beginnings the company has developed its line of coal-mining machinery, electric locomotives and elevating, conveying and crushing machinery.

The Stowell Co., South Milwaukee, Wis., which was reported to have been destroyed by fire in the Jan. 15 issue advises that although the plant was damaged considerably the greater part of the operations were continued within four days, only annealing and soft iron cleaning being done outside. The Wisconsin Appleton Co., has taken over all real estate and personal property of the Stowell Co. and will continue to operate the plant. Details of the organization of the new company have not been completed.

The entire plant of the Baldwin Locomotive Works, located near the heart of Philadelphia for more than half a century will have been moved to Eddystone, south of Philadelphia, by the middle of 1928, according to Samuel M. Vauclain, president of the company. He stated further that the Eddystone location, embracing 600 acres, offers plenty of room for expansion. The site of Eddystone is on the Delaware river, so that export shipments may

be made with facility. Plans for two additional buildings at this plant are being made, for a brass shop and general machine shop.

Morris Foundry, Fond du Lac, Wis., Newton Morris, proprietor, has purchased additional property at Marquette and East Sibley streets which will be converted into a foundry to operate in conjunction with its present foundry at 20 East Sibley street. The project will cost in the neighborhood of $15,000. The Morris Brothers foundry was removed to Fond du Lac from Racine in 1920. At that time it was conducted by Oscar Morris and Charles Stephens. In 1922 Newton Morris purchased the interests of the two partners and changed the name to the present one. The addition of the new property will increase the floor space from 17,922 feet to 31,322 feet.

New Trade Publications

REFRACTORIES—A folder describing the use of its refractory cement in brass furnace linings has been issued by the Botfield Refractories Co., Philadelphia.

TRAMRAILS—Handling materials by means of its tramrail systems is shown in pictorial form in a folder published by the Cleveland Crane & Engineering Co., Wickliffe, O.

ENGINES—Diesel engines of the four-cycle, air injection type and details of construction and design are presented in a catalog issued by the Fulton Iron Works, St. Louis.

PYROMETER CONTROLLER—Bristol Co., Waterbury, Conn., has issued a bulletin covering automatic temperature control in heat treatment of steel by means of its devices.

INDUSTRIAL ELECTRIC HEATING—Sta-Warm Electric Heater Corp., Ravenna, O., has issued a bulletin covering its industrial heating devices for various uses.

MOTOR—Totally enclosed, fan-cooled, direct-current motors are described and illustrated in a bulletin by the General Electric Co., Schenectady, N. Y.

CRUCIBLES—An inexpensive storage oven for graphite crucibles is described in a pamphlet issued by the Plumbago Crucible Manufacturers' Publicity Bureau, New York.

WELDING RODS—The advantages of using a new welding rod for arc welding are described in a pamphlet issued by the Chicago Steel & Wire Co., Chicago. Analyses of the rods and prices are given.

CORROSION RESISTANCE—Truscon Steel Co., Youngstown, O., has published a booklet describing the rust resisting properties of copper bearing steel which it uses in the various products manufactured by the firm.

CATALOGS—The Whiting Corp., Harvey, Ill., has issued a pamphlet with illustrations of the various products of its manufacture. The number of the catalog devoted to the product also is shown.

FOUNDRY SUPPLIES—S. Obermayer Co., Chicago, has published a new catalog of supplies for the foundry. The catalog is well illustrated, gives the sizes of the equipment, etc., and other information.

ABRASIVES—The Carborundum Co., Niagara, Falls, N. Y., has issued a catalog describing a new improved wheel chuck for grinding. Features of construction and mounting of abrasive segments are presented.

ELECTRIC FIXTURES—Safety switch conduletes manufactured by the Crouse-Hinds Co., Syracuse, N. Y., are shown in a folder issued by the firm. Various types of plug receptacles also are shown.

CENTRIFUGAL PUMPS—Single-stage, double-suction, volute centrifugal pumps of several different sizes are described in a catalog issued by the Ingersoll-Rand Co., New York. Cross sections of the various parts are shown to give constructional features.

CRANES—Harnischfeger Corp., Milwaukee, has issued a catalog describing its series of caterpillar-type cranes. These may be fitted with a magnet for unloading iron or with various types of excavating apparatus. Illustrations of the types and of the various component parts of the cranes are shown.

FOUNDRY EQUIPMENT—Molding machines, flasks, bottom boards, matchplates and other foundry appliances manufactured by the Adams Co., Dubuque, Iowa, are described in a 42-page catalog recently issued. Constructional features of each are noted.

MILLS—Roller mills with air separation for grinding and pulverizing coal, clay, foundry facing, limestone, and other materials are shown in a catalog recently issued by the Raymond Bros., Chicago. Views of the mills installed in industrial plants are shown.

CARBON MONOXIDE METER—Bacharach Industrial Instrument Co., Pittsburgh, has issued a leaflet on its electric meter for measuring carbon monoxide in the adjustment of high speed internal combustion engines.

TUMBLING MILL—A continuous tumbler for cleaning of castings is described in a pamphlet published by the J. W. Paxson Co., Philadelphia. The tumbler is said to be self-feeding, continuous, automatic and dustless.

INDUSTRIAL HEATING—Unit heaters of the fan or blower type are shown in a catalog published by the Buffalo Forge Co., Buffalo. The heaters may be placed in various positions about the shop to maintain a constant temperature.

SPECIAL CASTINGS—Castings for use in high temperature work or in corrosive processes are described in a catalog issued by the Southern Manganese Steel Co., St. Louis. A 28-page handbook insertion containing data on heat-resisting alloys also is enclosed.

PATTERN LUMBER—Sugar Pine Sales Co., San Francisco, has published an 18-page booklet showing the uses of sugar pine in pattern construction. Seasoning and careing for the lumber are given. Illustrations of the various grades of lumber also are included.

FOUNDRY EQUIPMENT—Several bulletins have been issued by the Whiting Corp., Harvey, Ill., covering its tumbling mills, dust filter and balanced cupola charger. Each is illustrated with halftones of the devices and text to make clear their construction, operation and accomplishments.

SILICA SAND—A booklet showing the production of silica sand from quarry to finished product in picture form, is being issued by the Portage Silica Co., Youngstown, O. Silica sand mined by this firm can be supplied either for molding or sandblasting.

DRAFT GAGES—Indicating and recording draft gages manufactured by the Foxboro Co., Inc., Foxboro, Mass., are suggested as a matter of economy in boiler operation in a leaflet, which also suggests that fuller information may be obtained in another publication by the company.

MONOLITHIC HEARTHS—A booklet describing the use of a chrome ore compound manufactured by the E. J. Lavino & Co., Philadelphia, for hearths and furnace bottoms, recently has been published. Instructions for use and the types of furnaces in which the compound has been used successfully are given.

MOLDING MACHINES—Jolt squeeze, plain jolt, combination jolt and power squeeze molding machines with electric pattern draw and in portable and heavy duty types are shown in a catalog published by the William H. Nicholls Co. Inc., Brooklyn, N. Y. Sizes and capacities of the machines are given and the illustrations are from installations.

ROLLING DOORS—Steel rolling shutters and rolling firedoors and shutters manufactured by the Cornell Iron Works, Inc., Long Island City, N. Y., are shown in a catalog issued by the firm. Various features of construction are given with diagrams of the various types. The catalog is illustrated from photographs of typical installations.

SPECTROGRAHS AND SPECTROMETERS—Adams Hilger Ltd. 24 Rochester place, London, England, has published two pamphlets describing spectrographs and spectrometers for use in physical, chemical, metallurgical and radiographic laboratories. One type of spectrograph has been designed especially for rapid detection and estimation of nickel and chromium in steel under shop conditions.

ELEVATING MACHINERY—Numerous elevating devices for handling granular materials on the principle of the skip hoist, full automatic, semiautomatic and manually controlled, are presented in a bulletin by the R. H. Beaumont Co., Philadelphia. Definite suggestions for their use in various situations and for various materials are given, with views of installations now in use.

WIRE ROPE—Much practical information about the use and care of wire rope, how to measure it, how to and how not to uncoil it, making of splices, how to sieze and socket it, is included in a handbook issued by the American Cable Co., New York. Drawings illustrate how to make equalizing slings, bridle slings and other equipment. The book covers various phases of use and care of wire rope.

CORE AND MOLD OVENS—A catalog has been issued by the Foundry Equipment Co., Cleveland. It discusses various fuels for core and mold oven operation and then proceeds to description of various types of ovens from the standpoint of adaptability to different classes of work. A discussion of dry sand mold practice is included, being regarded as an important development from present conditions in foundry work.

FLEXIBLE SHAFT COUPLING—A flexible coupling introduced by W. H. Nicholson & Co., Wilkes-Barre, Pa., is illustrated in a bulletin recently issued. It is of metal throughout and misalignment is cared for by loose-fitting floating keys with bevel sides. These keys engage in slots by centrifugal action. The entire interior of the coupling is filled with oil to insure easy running. Full details of construction are shown in illustrations.

ROLLER BEARINGS—A handbook of information on the application of its roller bearings has been compiled and published by the Hyatt Roller Bearing Co., Newark, N. J. It contains data of value to engineers and draftsmen concerned with the designing and development of plant and production equipment. This bulletin is supplemental to other publications by this company, covering in one volume from bearing applications to general types of industrial equipment. It contains load and rating tables, formulas for determining bearing sizes for specific applications, suggestions for mountings and construction details of all types of the company's roller bearings.